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ABSTRACT

In 1998, Congress authorized implementation of a 3-year pilot breakfast program involving 4,300 students in elementary schools in 6 school districts representing a range of economic and demographic characteristics. The program began in the 2000-01 school year. This lengthy report presents the findings from the pilot's first year. The study had two main objectives: (1) to assess the effects of the availability of universal free school breakfast on breakfast participation and selected student outcome measures, including dietary intake, cognitive and social/emotional functioning, academic achievement tests, school attendance, tardiness, classroom behavior, food insecurity, and health; and (2) to document the methods used by schools to implement universal free school breakfast and determine the effect of participation in this program on administrative requirements and costs. Students were measured on dietary intake, cognitive functions, and height and weight. Following are some of the key findings: Food energy, protein, and vitamin and mineral intakes of most students in treatment and control groups met the standards for dietary adequacy; there was no difference in math and reading score gains across all grades between treatment and control groups; and increased breakfast participation resulted in lower per-meal labor costs in treatment schools. (WFA)

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Report No. CN-02-SBP

Evaluation of the School Breakfast Program Pilot Project:

Findings from the First Year of Implementation

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Evaluation of the School Breakfast Program Pilot Project: Findings from the First Year of Implementation

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Staff from multiple organizations have worked collaboratively as the evaluation team. Abt Associates Inc. oversaw the evaluation and conducted the Impact Study. Key staff include Patty Connor, Joanna Golding, Ellie Lee, Nancy McGarry, Lindsay Page, Amanda Parsad, Cristofer Price and Diane Stoner. Promar International conducted the Implementation Study. Key staff include Anne Krome, Marina Mohamed, Anna Murphy, Cherie Root, Tracy Rubovits, Don Westfall, and Brooke Wilbraham. The CDM Group coordinated the work of school and district liaisons and collected record data in each district. Bob O'Brien, Nancy Brown, Candice Grayton, and Clair Kollar are key CDM staff. Shelley Pazer and Ellen Sackoff from The Discovery Group conducted the focus groups with students. Mary Stevens and staff at the University of Minnesota's Nutrition Coordinating Center helped define procedures and provided training on the system used to collect and analyze the nutrition data. Alicia Carriquiry, Mark Davison, Douglas Detterman, Lynn Hewes, Clement Stone, Sheila Terry, and Kyla Wahlstrom contributed a great deal to the effort as project consultants. Larry Orr and Frederic Glantz from Abt Associates conducted internal technical reviews, and Maissa Boulos and Eileen Fahey led the report production effort.

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Evaluation of the School Breakfast Program Pilot Project: Findings from the First Year of Implementation

Executive Summary

Background

Participation in the School Breakfast Program (SBP) by children from low-income households continues to be less than their participation in the National School Lunch Program (NSLP). There is concern that children might be coming to school without eating breakfast and still not be participating in the SBP for a variety of reasons, including a perceived stigma associating school breakfast participation with poverty. Breakfast is an important meal and several studies appear to link the consumption of nutritious breakfasts to improved dietary status and school performance. One approach to increasing participation in the SBP is to offer free breakfast to all students, regardless of their household's ability to pay for the meal. It is believed that a universal-free breakfast program would result in more children consuming a nutritious breakfast and beginning the school day ready to learn. This approach to increasing breakfast participation, however, would substantially increase the cost to the federal government as a result of subsidizing school breakfasts at the free-rate for all students. Thus it is critical to know if such expenditures are warranted. Specifically, would the increase in SBP participation result in improved dietary intake and/or academic performance?

Toward this end, Congress enacted Section 109 of the William F. Goodling Child Nutrition Act of 1998 (Public Law 105-336), authorizing implementation of a three-year pilot in elementary schools in six school districts representing a range of economic and demographic characteristics. The Food and Nutrition Service was also directed to evaluate this pilot. The three-year pilot began in school year (SY) 2000-2001 in the following school districts, which were chosen from among the 386 school districts that applied to participate:

- Shelby County Board of Education, Columbiana, Alabama;
- Washington Elementary School District, Phoenix, Arizona;
- Santa Rosa City Schools, Santa Rosa, California;
- Independent School District of Boise City, Boise, Idaho;
- Wichita Public Schools, Wichita, Kansas; and
- Harrison County School District, Gulfport, Mississippi.

The aim of this pilot is to study the impact of the availability of universal-free school breakfast on breakfast participation and measures related to students' nutritional status and academic performance. *This pilot is not intended to evaluate the current SBP or the value of consuming breakfast.*

Objectives

The two main objectives of the evaluation are to: (1) assess the effects of the availability of universal-free school breakfast on breakfast participation and selected student outcome measures, including dietary intake, cognitive and social/emotional functioning, academic achievement tests, school attendance, tardiness, classroom behavior and discipline, food insecurity, and health; and (2) document the methods used by schools to implement universal-free school breakfast and determine the effect of participation in this program on administrative requirements and costs.

Study Design and Methodology

The evaluation is based on an experimental design in which schools within each district were randomly assigned to implement the universal-free school breakfast (treatment schools) or to continue to operate the regular SBP (control schools). There are 79 treatment and 74 control schools in the pilot. In Spring 2001, about 4,300 students across the treatment and control schools were measured on dietary intake, cognitive function, and height and weight. Other data were also collected from parents and teachers. An analysis of these measures, data extracted from school records for SY 1999-2000 (pre-implementation) and SY 2000-2001, and information collected during interviews with school district staff in Spring 2001 are presented in this interim report.

Findings

Key findings from the first year of the pilot include:

Breakfast Participation and Dietary Intake

- Participation in the SBP nearly doubled in the treatment schools (from 19 to 36 percent). Greater increases were seen among the paid-eligible participants than the free and reduced-price participants.
- Few elementary school students, less than 4 percent in both treatment and control schools, skipped breakfast altogether.
- Students in treatment schools (80 percent) were more likely than control school students (76 percent) to consume a nutritionally substantive breakfast.
- Given that most students in this study consumed breakfast, universal-free school breakfast seems to have shifted the source of breakfast from home (or elsewhere) to school.
- Students in treatment schools (7 percent) were more likely than control school students (4 percent) to consume two or more substantive breakfasts.
- There was almost no difference in the food and nutrient intake of treatment and control school students at breakfast or over the course of a day. Food energy, protein, and vitamin and mineral intakes of most students in both groups met the standards for dietary adequacy.

- Few students, teachers, or principals in either treatment or control schools reported a stigma that associated breakfast participation with students from low-income households.

Cognitive Functioning and Academic Achievement Test Scores

- Treatment and control school students had similar scores on a cognitive test battery that assessed a range of cognitive functions including attention, short-term and long-term memory.

- There were no differences in math and reading score gains across all grades between treatment and control school students.

Other Measures

- School attendance, tardiness, social/emotional functioning, food insecurity, and health status were not different for treatment and control school students.

- The prevalence of overweight was similar, but high, in both treatment (17 percent) and control (18 percent) school students.

- There was one significant difference on a behavior rating between the treatment and control school students. Treatment schools students had a slightly more negative rating. In addition, a significantly higher number of disciplinary incidents we[illegible]rded in treatment schools.

Implementation-Related Findings

- School breakfast participation was much higher in treatment schools in which students ate breakfast in classrooms (65 percent) than when they ate in a cafeteria or other non-classroom setting (28 percent).

- Treatment school breakfasts were just as likely as control school breakfasts to meet SBP nutrition standards for food energy, target nutrients, and total and saturated fat.

- Increased breakfast participation resulted in lower per-meal labor costs in treatment schools.

Conclusion

During the first year of implementation, the availability of universal-free school breakfast nearly doubled school breakfast participation (from 19 to 36 percent). Since most elementary school students in this study were consuming breakfast, the availability of free breakfast seems to have primarily shifted the source of breakfast from home to school. Given the low rate (less than 4 percent) of breakfast skipping, it is not surprising that the availability of universal-free school breakfast did not have a significant impact on measures of dietary intake or school performance. Whether two additional years of exposure to the availability of universal-free school breakfast will have an impact on student outcomes will be determined after data collection and analyses for all three years are completed. A report of the findings on the impact of the availability of universal-free school breakfast on elementary school students over the three-year period will be available in 2004.

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Chapter One

Introduction

The School Breakfast Program (SBP) was established more than 30 years ago, largely in response to concerns about hunger among low-income children. The SBP was modeled after the National School Lunch Program (NSLP), which had been in existence for some 20 years when the SBP was established. The combination of the NSLP and SBP was intended to provide "a coordinated and comprehensive child food service [program] in schools"(Public Law 89-842).

Recent research has indicated that there is a need for the SBP among low-income children. Sampson and her colleagues (1995) found that about one quarter of the low-income children in their study arrived at school without having had breakfast. Yet, a relatively small proportion of low-income children take advantage of the availability of free and reduced-price breakfasts in their schools (Rossi, 1998). Offering a free breakfast to all school children, regardless of family income, is viewed as a promising vehicle for removing what some believe to be a barrier to increasing participation, a stigma associating poverty status with SBP (e.g., Food Research and Action Center, 2001). In 1998, Congress established the School Breakfast Program Pilot Project (SBPP) as a demonstration of universal-free school breakfast to provide information on this alternative approach to school breakfast (Public Law 105-336).

As part of the mandate for the SBPP, Congress required an evaluation of the universal-free school breakfast demonstration project. The U.S. Department of Agriculture's Food and Nutrition Service (FNS) initiated the evaluation in June 2000. It is an ongoing study, with two years of data collection and analysis remaining. This document serves as an interim report of the findings. Data collected on schools and children for the year prior to the SBPP and during the first year of project implementation are reported here.

This chapter provides the background and context for the School Breakfast Program, the SBPP, and its evaluation.

The School Breakfast Program

The School Breakfast Program (SBP), authorized by the Child Nutrition Act of 1966, started as a pilot program to provide funding for breakfasts in schools serving poor children and in areas where children had to travel a great distance to school. Higher federal payments were offered for schools identified as having "severe need" as a way of encouraging participation by schools in low-income areas, which had higher costs of operations. Congress authorized the SBP as a permanent program in 1975 and, while it continued providing higher reimbursements for schools in areas of severe need, declared its intent to target the SBP to "all schools where it is needed to provide adequate nutrition for all children in attendance" (Public Law 94-105).

In 1989, the Child Nutrition Act was amended with the specific intention of expanding the availability of the SBP in the nation's schools. The Secretary of Agriculture was required to award start-up grants, administered through State Agencies, to a "substantial number of States" on a competitive basis. The total level of funding for these grants in 1990 was $3 million, which was to be used to help schools with non-recurring costs associated with initiating SBP.[1] Since that time, the size of the SBP has doubled, from 3.8 million breakfasts per day in federal fiscal year (FY) 1989 to 7.6 million in FY 2000 (FNS, 2002). The program is available in approximately 70,000 schools (compared to over 97,000 schools offering NSLP). The program continues to serve primarily low-income children. Of the breakfast meals served in FY 2001, 85 percent were served to children who received their meals free or at a reduced price.

FNS oversees the SBP, which operates in essentially the same manner as the NSLP. The program provides cash subsidies (commodities are tied to the NSLP) for school breakfasts served to children at all income levels. Eligible institutions include public schools, private non-profit schools, and public or private non-profit licensed residential childcare institutions. Schools and institutions that participate in the SBP must serve breakfasts that meet federal nutrition standards and must provide free and reduced-price meals for those that are determined eligible. Children from households with income at or below 130 percent of the federal poverty level receive breakfast at no charge (free-eligible); those from households with income between 131 and 185 percent of the poverty level pay no more than 30 cents for breakfast (reduced price-eligible); and children from households with income above 185 percent of poverty must pay the price established by the SFA for a school breakfast (paid-eligible). In SY 2000-2001, the maximum free-eligible income for a family of four was $22,165; the maximum reduced-price eligible income for a family of four was $31,543.

FNS reimburses school districts for each meal that meets the program requirements. For SY 2000-2001, the subsidy for free breakfast was $1.12. The subsidy for reduced-price breakfast was $0.82, and the subsidy for paid breakfast was $0.21.[2]

Nutrition Standards for School Breakfast

Until the mid-1990s, the school breakfasts that were served were required to meet a meal pattern that approximated one fourth of the Recommended Dietary Allowances (RDAs) of certain specified nutrients. In response to data suggesting that school meals were not in line with goals that had been set by the federal *Dietary Guidelines for Americans* (Burghardt et al., 1993), FNS launched the School Meals Initiative for Healthy Children (SMI) in 1995.[3] With the goal of improving the nutritional quality of school meals, the SMI established new nutrient-based standards for school meals. Specifically, schools that participate in the SBP must serve breakfasts that are consistent with the appropriate *Dietary Guidelines for Americans*: eat a variety of foods; choose a diet with plenty of grain products, vegetables, and fruits; choose a diet moderate in sugars and salt; and choose a diet with 30 percent or less of calories from fat and less than 10 percent of calories from saturated fat. In addition, breakfasts must provide, on average over the course of each school week, at least 25 percent of the RDA for food energy (calories), protein, iron, calcium, and vitamins A and C for age/grade-specific categories.

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[1] Changes made by the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA; Public Law 104-193) eliminated this grant program.

[2] Reimbursement rates are higher for schools in severe need areas (up to an additional $0.21) and in Alaska and Hawaii.

[3] Federal Register 60:113, 31188-31222, June 13, 1995.

The SMI also provides school foodservice staff with educational and technical resources to encourage children to eat healthy meals and assist staff in preparing nutritious and appealing meals. Finally, SMI and other changes in program regulations expanded the menu planning options available to schools.

Program Utilization

As stated above, although the legislative intent of the SBP was to provide a nutritious breakfast to low-income children who might not otherwise receive one, many are not taking advantage of the availability of free and reduced-price breakfasts in their schools. Using data from the first School Nutrition Dietary Assessment Study (SNDA-I), Rossi (1998) reported that in schools where the program is available, only 78 percent of children who are eligible for free or reduced-price meals are certified to receive meal subsidies.[4] Of those certified, only 37 percent participate in the breakfast program. The combined effect is that only 29 percent of children eligible for free and reduced-price breakfast are eating school breakfasts.

Concerned that the SBP (and the NSLP) is not successful in reaching many children from low-income families, in 1990 Congress directed USDA to conduct a study to determine "why children eligible to participate for free and reduced-price do not apply or participate" in school nutrition programs (Public Law 101-624). That study found that one major factor affecting application and participation decisions in both the SBP and NSLP is the perceived stigma of receiving free and reduced-price school meals (Glantz et al., 1994a). However, stigma was more of an issue for the SBP than the NSLP and for high school students than elementary school students. Parents and older children view the school nutrition programs more as welfare than as nutrition programs. Their perception is that receiving free or reduced-price meals labels children and their families as poor and sets them apart from other students. While program regulations require school districts to ensure that children approved for free or reduced-price meals are not overtly identified, the perception is that simply eating a school breakfast carries a stigma regardless of one's income status.

Thus, the program is under-utilized by those eligible to receive free or reduced-price meals, and one barrier to participation appears to be the stigma associated with eating school breakfast.

Research on the Relationship Between Breakfast and Student and School Outcomes

The under-utilization of the SBP is a cause for concern if it means that eligible children are hungry or undernourished. Much of the existing research deals with children younger than school age, but as the Center on Hunger, Poverty and Nutrition Policy (1998) has indicated, even nutritional deficiencies of a relatively short-term nature can negatively impact a child's cognitive development. For a detailed review of this literature, please see the Briefel et al. (1999) review funded by the Food and Nutrition Service. A summary of the main findings and issues reported in the literature is provided here.

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[4] Children are certified if their family applies to participate and they meet the current household income criteria. Children are automatically eligible for free school meals if they are a member of a household that receives food stamps, benefits under the Food Distribution Program on Indian Reservations, or, in most cases, benefits under the Temporary Assistance for Needy Families (TANF) program.

Collectively, the literature on breakfast consumption suggests that eating breakfast not only can positively impact a child's cognitive development and academic performance, but also may hold implications for a child's dietary status and psychosocial functioning. Research on such programs indicates that school breakfast consumption may lead to decreased rates of absenteeism and tardiness (Pollitt and Mathews, 1998; as reviewed in Peterson et al., 2001) and better cognitive functioning (e.g., improved attention, memory) and academic performance (grades, test scores) (as reviewed in Peterson et al., 2001). Still, as Ponza and colleagues point out (1999), no studies have provided conclusive evidence that SBP participation leads to improved short- or long-term cognitive or academic outcomes.

This lack of conclusive evidence may be the result of a number of limitations in existing studies. Such limitations include unreliable measures of participation, use of non-experimental study designs, minimal attention to any one outcome, differences in breakfast interventions studied, inappropriate measures of statistical significance, and the inherent characteristics of the study population (Ponza et al., 1999; Cromer, Tarnowski, Stein, Harton and Thornton, 1990; Pollitt and Mathews, 1998). Despite these weaknesses, as Pollitt and Mathews (1998) note, the existing research collectively points to the negative effect of skipping breakfast on cognitive functioning and learning, an effect that is more pronounced in nutritionally at-risk or malnourished children than in those who are well-nourished. The effects of school breakfast more specifically are less clear.

Evidence on the Effects of Breakfast on Children's Outcomes

Cognitive Functioning and Academic Performance

Research on the effects of breakfast consumption on cognitive outcomes remains inconclusive. In an investigation of the effects of missing breakfast on cognitive functioning, Simeon and Grantham-McGregor (1989) studied stunted (low height-for-age), non-stunted, and previously severely malnourished children in Jamaica. While the control group in this study was not adversely affected by the omission of breakfast, both stunted and previously malnourished children were negatively affected in a task of verbal fluency. In addition, non-experimental analyses showed that wasted children (low weight-for-age) were adversely affected when they did not eat breakfast, regardless of experimental nutritional group.

Similar findings were reported in a study of a breakfast program in Huaraz, Peru (Jacoby, Cueto and Pollitt, 1996). The researchers found a positive correlation between weight and vocabulary test scores for students in the treatment group and suggested that, where resources are limited, breakfast programs should be targeted to undernourished children, as these are the children most likely to benefit from a meal program.

One study of breakfast consumption timing (Vaisman et al., 1996) found that after 15 days of breakfast service to a treatment group at school, these students scored noticeably higher on tests of cognitive functioning than did students in the control group who may have eaten breakfast at home and who were not given a supplement at school. Study children who routinely ate breakfast two hours before testing did not improve their cognitive scores, whereas food supplementation 30 minutes before testing was associated with improved scoring.

In two other studies of breakfast timing, Pollitt and colleagues (1983) found that breakfast omission directly affected late morning problem-solving ability in 9- to 11-year old children. The authors suggested that this relationship could be linked to the child's metabolic status. Other studies, however, found no cognitive advantage or disadvantage to skipping breakfast in looking at well-nourished middle-class children. Pollitt, Leibel and Greenfield (1981) found no effect of skipping breakfast on performance on speed and accuracy tasks. Similarly, in a study of ninth-grade middle-class students, Cromer et al. (1990) reported no significant difference in cognition between students who participated in a school breakfast program and those who fasted through breakfast.

In a study of the impact of SBP participation on achievement test scores, Meyers and colleagues found that, controlling for other factors, SBP participation was associated with significantly improved scores on subscales of the Comprehensive Test of Basic Skills (CTBS). While the authors concede that these results may be confounded by student self-selection and a number of other variables, these findings still suggest positive effects of eating breakfast (Meyers, Sampson, Weitzman, Rogers and Kayne, 1989). Measures of academic achievement have often been included in evaluations of universal-free breakfast programs, with mixed findings. For example, Murphy and his colleagues (Murphy et al., 2001; Murphy and Pagano, 2001) have found increases in academic achievement associated with universal-free breakfast participation in Baltimore and Maryland, whereas Peterson and her colleagues in Minnesota (2001) have not.

Behavior

While Cromer et al. (1990) found no change in "mood state" as a result of eating or skipping breakfast, other studies have found improved student behavior to be a benefit of school meals programs. A 1994 study of teacher attitudes concerning an elementary school SBP in Connecticut found that the majority perceived the program as helpful in improving student behavior and a positive influence on the school day (as cited by Peterson et al., 2001).

Other researchers have highlighted the connection between breakfast consumption and psychosocial functioning. Through interviews with school children and their parents from three inner-city schools in Philadelphia and Baltimore, Murphy et al. (1998a) found that children who ate breakfast at school less often had significantly worse scores on standardized measures of emotional and behavioral symptoms and that students who increase their school breakfast participation showed significant decreases in problems on the same measures.

In another sample, this research team (Murphy et al., 1998b) reported a connection between child hunger and psychosocial problems. Through interviews with school children and their parents from four inner-city schools in Philadelphia and Baltimore, Murphy et al. (1998b) found that hungry children or those at risk of hunger (as measured by questionnaires administered to parents and children) were twice as likely to be categorized as having impaired functioning, meaning that as compared to non-hungry children, they are more likely to be irritable, anxious, aggressive, and hyperactive. The study additionally found that these children are more likely to be tardy or absent from school.

While Murphy et al. (1998a, 1998b) also found that hunger and being at risk of hunger were associated with higher levels of absenteeism and tardiness, there is no definitive answer on the possible effects of school breakfast participation on attendance and tardiness. Meyers et al. (1989) found a negative relationship between school breakfast participation and absenteeism and tardiness. As mentioned earlier, however, this study suffered from methodological weaknesses. Other, more recent studies showed no significant increase in rates of attendance (Peterson et al., 2001; Murphy and Pagano, 2001).

Nutritional Benefits

Previous research has shown the importance of breakfast consumption to children's diets, including intake of food energy and key vitamins and minerals. In a study comparing breakfast consumption to short-term fasting, Pollitt, Leibel, and Greenfield (1981) found that children fasting rather than eating breakfast experience "considerable metabolic stress," as indicated by metabolic changes in the fasting group. In addition, there has been consistent evidence showing that breakfast consumption significantly improves nutrient intake over 24 hours (Devaney and Fraker, 1989; Nicklas et al., 1993, 1998; Sampson et al., 1995). Looking at the effects of a school breakfast program in rural Peru, researchers found significantly improved dietary intake of energy, protein, and iron for program participants (Jacoby, Cueto and Pollitt, 1996). Research in this country focusing on the effects of the SBP has shown higher intakes at breakfast of food energy, protein, several vitamins and minerals, and dietary fiber for participating students (Devaney and Fraker, 1989; Devaney et al., 1995; Gleason and Suitor, 2001), with some of these differences persisting over 24 hours (Gleason and Suitor, 2001). Devaney and Stuart (1998) also report that low-income students were more likely to eat a robust breakfast when participating in the SBP.

School Breakfast Initiatives

Despite recent federal initiatives to increase participation in the School Breakfast Program (e.g., start-up grants awarded in the early 1990s), a number of barriers to participation still exist. In looking at SBP programs in Massachusetts, for example, a recent report from Project Bread (2000) noted that stigma was mentioned as a barrier to SBP participation in parent focus groups. School schedules were also seen by the report authors as a barrier to participation because breakfast in the schools studied was served 15 minutes before school started. Barriers noted by others have included school meal prices, competing à la carte offerings, lack of time to eat in the cafeteria (speed of service and convenience), bus schedule/transportation issues, space/environment, and student preferences for foods not served in the SBP (Reddan et al., 2002; Rosales and Janowski, 2002). School breakfast advocates have argued that steps taken to counter these barriers result in higher participation: "Generally, higher rates of participation in breakfast reflect greater efforts to involve more students, reduce stigma…make meals and the setting attractive, engage in outreach, educate families about the value of school breakfast, eliminate barriers to application for reduced-price or free meals, move more schools to universal breakfast, and otherwise make the program attractive and sensible" (Food Research and Action Center, 2001).

Congress has offered some support at the federal level for increasing school meal participation by amending the National School Lunch Act to ease school meals eligibility determinations. Provision 2 and 3, in particular, are increasingly being used to offer school meals at no charge and to reduce the paperwork associated with the eligibility determination process. In general, these provisions allow meals to be reimbursed for a four-year period based on the number of free, reduced-price, and paid lunches served in the base year.[5] Meals are offered to students at no cost, and schools do not have to conduct free and reduced-price certification after the base year (FNS, 2002). In SY 1998-1999, 2,358 schools used Provision 2 and 427 used Provision 3 (Promar and Gallup, 2001). A pilot universal-free breakfast project in Philadelphia illustrates how cost effective such a program can be. McGlinchy (1992, as cited in Peterson et al., 2001) found that in schools where 70 percent of students were eligible for a free meal, 13,000 hours of administrative time and $96,000, in total, were saved by forfeiting cash collection.

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[5] Under Provision 2, the first year of the four-year period is the base year. Under Provision 3, the base year is not included as part of the four years.

There have also been a number of states and individual school districts that have funded efforts to increase participation in the School Breakfast Program in recent years. According to the Food Research and Action Center (2001), 22 states provide funds related to school breakfast, and four states, Illinois, Massachusetts, Maryland, and Minnesota, fund universal-free breakfast programs. In two of these states (Illinois and Minnesota), universal-free breakfasts are offered in schools that serve a certain percentage of students eligible for free or reduced-price meals.

In addition to states, some school districts are implementing universal-free breakfast programs. Exhibit 1.1 presents some examples of states and school districts with universal-free school breakfast programs that have included evaluations. These efforts have been successful at increasing participation, and their evaluators report other positive outcomes associated with the implementation of universal-free school breakfast, including improved academic achievement and decreased rates of tardiness and absenteeism. While the evaluations yield results suggesting beneficial effects of offering universal-free school breakfast, many of the studies are small in size and/or use non-experimental designs. Thus, the need clearly exists for a larger, more scientifically sound study of the potential effects of school breakfast participation.

The School Breakfast Pilot Project

The William F. Goodling Child Nutrition Act of 1998 (Public Law 105-336, section 109) authorized the Secretary of Agriculture, through the FNS, to conduct a pilot study that provides free school breakfasts to all students regardless of family income. Included in the legislation were guidelines for conducting the demonstration, which specified the inclusion of six school districts, a three-year demonstration period, the inclusion of urban and rural elementary schools that had varying family income levels, and a design that would permit a valid evaluation of the demonstration.

The SBPP demonstration that resulted is a three-year commitment by the six school districts selected for the program. Half of the participating schools in each district continue to provide the regular School Breakfast Program (control schools), while the other half offer universal-free school breakfast (treatment schools). FNS, through state Child Nutrition Agencies, reimburses the districts for all breakfasts served to students in the treatment schools at the federal reimbursement rate for free breakfast. School districts are given wide latitude to implement the SBPP in a way that best suits their local context. Thus, while the federal nutrition standards for breakfast must be maintained, the districts and/or treatment schools determine what is served, how it is served to students (e.g., brown bags picked up in the cafeteria, buffet style, etc.), and when and where breakfast is served. However, the districts are required to maintain the integrity of the school assignment to treatment or control status over the course of the three-year project.

In 2000, six school districts were selected from the 386 districts that applied to participate in the SBPP. The selection criteria incorporated factors outlined in the legislation authorizing the demonstration program, as well as some factors included to maintain the study design, eliminate confounding variables, and facilitate the implementation of the intervention. The criteria included: representation from rural, suburban, and urban areas in different parts of the country; current

Exhibit 1.1

Recent State and School District-level Universal-Free Breakfast Programs with Evaluations

Location	Number of Schools	Reference	Participation Increase?	Main Findings	Design
Boston, MA	14	Murphy, Hall, Feeney and Kleinman, 2000b; Murphy, Pagano, Patton, Hall, Marinaccio, and Kleinman, 2000a	Yes. (11 percentage points in less than one year)	Increased participation associated with reduced symptoms of hunger and improved nutritional status based on 24-hour dietary recalls. Increased participation also associated with improved academic achievement, reduced rates of absenteeism and tardiness, and fewer emotional/behavior problems. Staff reported improved student behavior and attentiveness.	Non-experimental; pre/post design.
State of Minnesota	313	Peterson, Davison, Wahlstrom, Himes, Hjelseth, Ross, and Tucker, 2001	Yes. (7 percentage points overall, 12 percentage points for reduced-price eligible students)	Principals reported students more attentive to learning tasks. No statistically significant results found for achievement or attendance.	Non-experimental; comparison schools were eligible for universal-free program.
State of Maryland	96 universal-free schools, 55 participated in this study	Murphy and Pagano, 2001	Yes. (45 percentage points when schools began serving breakfast in classroom)	In-classroom breakfast program associated with improvement in staff perception of student behavior and the school learning environment. Rates of tardiness and disciplinary suspensions were significantly lower. Standardized test scores were significantly higher for universal-free schools, but the sample size was small. No difference found for attendance, visits to the school nurse, or referrals to the principal's office for discipline.	Non-experimental; pre/post design and comparisons to demographically similar schools.
Baltimore, MD	55 universal-free schools, 31 participated in this study	Murphy, Pagano and Bishop, 2001	Yes. (Over 65 percentage points in schools with in-classroom breakfast)	In-classroom school breakfast programs were associated with significantly improved rates of attendance and improved standardized test scores.	Non-experimental; comparisons to matched schools in the district.
Central Falls, RI	Not reported. Treatment N = 225 students	Cook, Ohri-Vachaspati, and Kelly, 1996	Yes. (17.5 percentage points overall, 18.1 percentage points for low-income students)	Participation in the program was associated with decreased rates of tardiness and absenteeism and significantly better nutrient intake at breakfast.	Non-experimental; pre/post design with separate pre/post samples.

participation in the SBP; school districts that serve families with a range of income levels; students approved for free and reduced-price meals; an overall racial and ethnic mix across all six districts that represent the country as a whole; elementary-school grade configuration; a reported method of providing breakfast; integrity in administration of SBPP; and the availability of standardized achievement test scores.

The districts included in the pilot project are:

- Independent School District of Boise City, Boise, Idaho;
- Shelby County Board of Education, Columbiana, Alabama;
- Harrison County School District, Gulfport, Mississippi;
- Washington Elementary School District, Phoenix, Arizona;
- Santa Rosa City Schools, Santa Rosa, California; and
- Wichita Public Schools, Wichita, Kansas.

Overview of the SBPP Evaluation

The legislation authorizing the SBPP requires that the evaluation address two main research objectives:

1. Documentation of the methods used by schools to implement a universal-free breakfast program and determination of the effect of participation in the universal-free breakfast program on paperwork, costs, and other administrative requirements placed on schools.

2. Assessment of the effects of the universal-free breakfast program in elementary schools on student participation and selected student outcomes including dietary intake, school attendance and tardiness, classroom behavior and discipline, and academic achievement.

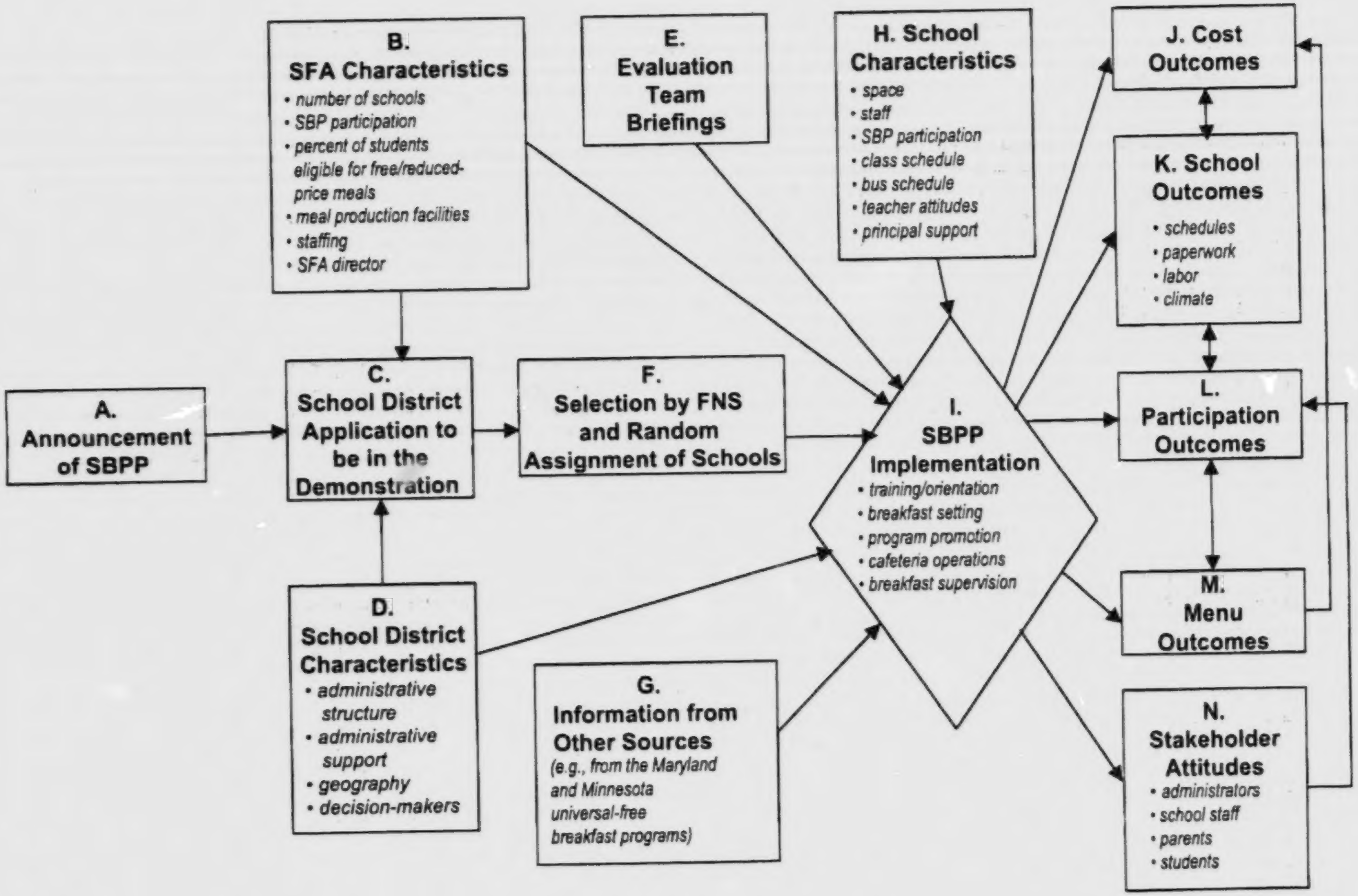
FNS contracted with Mathematica Policy Research, Inc. to develop a design for the evaluation of the SBPP (Ponza et al., 1999). Following the design phase, Abt Associates Inc., supported by the CDM Group and Promar International, won the competitive award to conduct the evaluation. To address the objectives outlined above, the evaluation was designed with both an Implementation and Impact Study. The Implementation Study gathers information primarily from school district personnel to examine how school districts and schools administer the SBPP and the SBPP's impact on their costs and administrative duties. The Impact Study gathers information from students, parents, teachers, and school records to determine the effects of universal-free breakfast on students.

Conceptual Models

Abt developed two conceptual models for this evaluation, one for understanding the pathways involved in the implementation of universal-free breakfast, and one for understanding the expected impacts. Note that there are overlaps in some components of the models (e.g., participation is included in each), as these components are important in thinking about the pathways of both implementation and impacts.

Implementation Model. Exhibit 1.2 depicts the pathways involved in the application and selection of the six districts for the SBPP demonstration, the implementation of the SBPP, and expected outcomes associated with implementation. FNS announced the demonstration in the Federal Register (A) and

Exhibit 1.2: Pathways to SBPP and Implementation Outcomes


A.
Announcement of SBPP
B.
SFA Characteristics
• number of schools
• SBP participation
• percent of students eligible for free/reduced-price meals
• meal production facilities
• staffing
• SFA director
C.
School District Application to be in the Demonstration
D.
School District Characteristics
• administrative structure
• administrative support
• geography
• decision-makers
E.
Evaluation Team Briefings
F.
Selection by FNS and Random Assignment of Schools
G.
Information from Other Sources
(e.g., from the Maryland and Minnesota universal-free breakfast programs)
H. School Characteristics
• space
• staff
• SBP participation
• class schedule
• bus schedule
• teacher attitudes
• principal support
I.
SBPP Implementation
• training/orientation
• breakfast setting
• program promotion
• cafeteria operations
• breakfast supervision
J. Cost Outcomes
K. School Outcomes
• schedules
• paperwork
• labor
• climate
L.
Participation Outcomes
M.
Menu Outcomes
N.
Stakeholder Attitudes
• administrators
• school staff
• parents
• students

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then the district (D) and the School Food Authority (SFA) (B), which runs the school meal programs in the district, decided to apply for the SBPP (C). Six districts were chosen by FNS (F) and meetings were held in Washington and in each site (E). As part of these meetings and through other sources (e.g., reports, phone conversations), school districts learned about universal-free school breakfast programs being implemented in other locales, including the states of Maryland and Minnesota (G). The implementation of universal-free breakfast (I)—where breakfast was served, what was served, how much the program was promoted, what training was needed, etc.—was influenced by the characteristics of the school (H), including such things as the physical space available for serving breakfast to a greater number of students, transportation and class schedules, and principal support for this new effort. Providing universal-free breakfast was expected to affect a host of outcomes, including costs (J); school operations (K); participation (L); menus (M); and stakeholder attitudes about school breakfast (N).

Impact Model. Exhibit 1.3 presents the model for studying the pathways by which the SBPP would be expected to affect school and student outcomes. This model depicts the implementation of universal-free school breakfast (A) with other "fixed" or given factors, such as characteristics of the student, family, and school (B and C).[6] The critical role of the Implementation Study in this evaluation is to define the way that the SBPP was developed in each site and assess whether differences in implementation across sites affect the desired school and student outcomes.

Attitudes of the students and their parents (D) are influenced by the students' background, but can also be influenced by their experience with universal-free school breakfast. The implementation of the program and student and school factors are believed to influence student participation in school breakfast (E), which in turn is hypothesized to have immediate effects following consumption of school breakfast on a given day (F), as well as more gradual effects based on consistent school breakfast participation (G). The more immediate pathway for the effects of breakfast to influence student outcomes is through metabolic changes, such as an increase in blood glucose, that affect student attention and cognitive functions important for completing schoolwork (H), including the ability to store information in memory and process visual-spatial information. Consistent participation in School Breakfast is hypothesized to improve a child's overall diet and nutritional status (G). This would positively influence a student's health (J) by improving overall health, reducing number of illnesses, improving body mass index, and reducing visits to the school nurse for illnesses. Potential longer-term outcomes include improved behavior (I) (e.g., increased self-regulation, emotional control, and improved social relationships), improved attendance and tardiness (L), and improved academic achievement outcomes (K) (e.g., achievement tests).

Note also that the school environment is expected to change as a result of the implementation of universal-free school breakfast (M). This change, reported in other studies of universal-free breakfast, would be expected to include such characteristics as the school's sense of community, number of disciplinary problems, and overall attitudes toward school breakfast.

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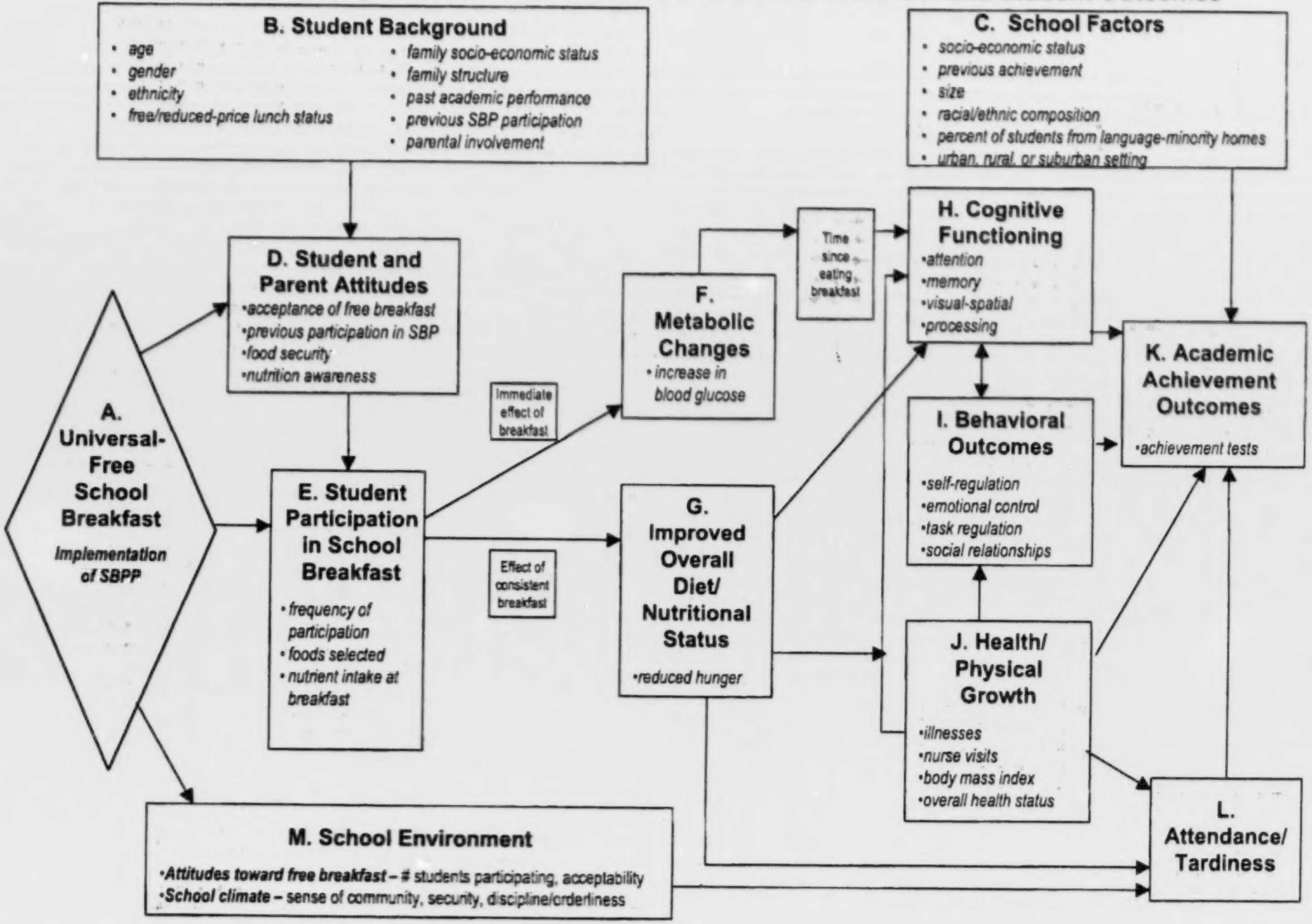
[6] Some of the student background characteristics, such as previous academic achievement, have a direct effect on academic achievement outcomes. To keep the model focused on the pathways of universal-free school breakfast, however, this link is not depicted.

Exhibit 1.3: Pathways of Universal-Free School Breakfast to School and Student Outcomes


B. Student Background
• age
• gender
• ethnicity
• free/reduced-price lunch status
• family socio-economic status
• family structure
• past academic performance
• previous SBP participation
• parental involvement
C. School Factors
• socio-economic status
• previous achievement
• size
• racial/ethnic composition
• percent of students from language-minority homes
• urban, rural, or suburban setting
A. Universal-Free School Breakfast
Implementation of SBPP
D. Student and Parent Attitudes
•acceptance of free breakfast
•previous participation in SBP
•food security
•nutrition awareness
E. Student Participation in School Breakfast
• frequency of participation
• foods selected
• nutrient intake at breakfast
Immediate effect of breakfast
Effect of consistent breakfast
F. Metabolic Changes
• increase in blood glucose
G. Improved Overall Diet/ Nutritional Status
•reduced hunger
Time since eating breakfast
H. Cognitive Functioning
•attention
•memory
•visual-spatial
•processing
I. Behavioral Outcomes
•self-regulation
•emotional control
•task regulation
•social relationships
J. Health/ Physical Growth
•illnesses
•nurse visits
•body mass index
•overall health status
K. Academic Achievement Outcomes
•achievement tests
L. Attendance/ Tardiness
M. School Environment
•Attitudes toward free breakfast – # students participating, acceptability
•School climate – sense of community, security, discipline/orderliness

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Organization of the Report

The report is divided into two parts. Part I presents the Implementation Study. It includes a description of the design and methodology (Chapter Two) and findings (Chapter Three) of the Implementation Study. Part II presents the Impact Study, with a description of the design and methodology (Chapter Four) and findings from the experimental analyses that focus on the impact on students of the availability of universal-free breakfast in their schools (Chapter Five). Chapter Six discusses the overall study findings and presents the schedule for the remaining evaluation tasks.

Appendices to the report include: supplementary exhibits for the Implementation Study (A); demographic characteristics of the impact student sample (B); a description of the statistical models used in the impact analyses (C); supplementary exhibits for the Impact Study (D); methodology for food and nutrient analysis (E); findings from impact analyses focusing on participation in school breakfast (F); exhibits for subgroup impact analyses (G); and a list of the data collection instruments available on the FNS website (H).

Part I

Implementation Study

Chapter Two

Implementation Study Design and Methodology

This chapter focuses on the design and methodology of the Implementation Study. A brief summary of the objectives and research questions, design, sample, data collection timeline, and analytic approach is presented.

Objectives and Research Questions

The primary objectives of the Implementation Study are to:

- Determine the various ways in which schools choose to implement universal-free school breakfast;
- Assess the effect of participation in universal-free school breakfast on administrative requirements and costs for both schools and the federal government; and
- Assess the effect of participation in universal-free school breakfast on the food and nutrient composition of school breakfasts.

Exhibit 2.1A presents the specific research questions related to the implementation process and Exhibit 2.1B presents the research questions related to the effects of participation in universal-free school breakfast on administrative requirements, costs, and the food and nutrient composition of school breakfasts. These research questions guided the design of the Implementation Study.

Design

The administration of school foodservice operations varies from school district to school district. In some cases planning and decision-making is highly centralized, while in other cases much of the planning and decision-making is decentralized and takes place at the individual school level. The design for the Implementation Study took this variation into account and included data collection at both the district level and the school level. In addition, the design acknowledges the important role played by school district and school administrators, as well as SFA directors. Through collection of information at all levels within each school district, a complete picture of the implementation process was gained. Information for the Implementation Study was collected through:

- **In-person interviews with school district administrators** focusing on past experience with the SBP, the decision to participate in universal-free school breakfast, implementation issues, and perceived impacts;

- **In-person interviews with SFA directors** focusing on SFA policy, organization, operating procedures, implementation decisions and issues, perceived impacts, and cost data;

Exhibit 2.1A

Implementation Research Questions

Topic/Question	Respondent/Data Source
Decision-making	
• What prompted the school district to apply for participation in universal-free school breakfast?	District Administrators; SFA Directors
• Who took part in the decision to apply?	District Administrators; SFA Directors; Principals
• What considerations were important in coming to this decision?	District Administrators; SFA Directors
• How much autonomy were individual schools granted in determining how to implement universal-free school breakfast?	District Administrators; SFA Directors; Principals
• At the school level, who participated in determining how to implement universal-free school breakfast?	SFA Directors; Principals
• Who determined where breakfast was served and eaten in individual schools?	SFA Directors; Principals
Training/Orientation	
• Were foodservice workers provided training and/or orientation relating to universal-free school breakfast during the year?	SFA Directors; Cafeteria Managers
• What was the nature of this training/orientation?	SFA Directors; Cafeteria Managers
• Who provided the training/orientation?	SFA Directors; Cafeteria Managers
• Is continuing staff support available to foodservice workers?	SFA Directors
• What is the cafeteria manager's assessment of the value of the training/orientation they received?	Cafeteria Managers
• What, if any, lessons were learned about training/orientation from the experience of the first year?	SFA Directors
Breakfast Setting	
• Where in the school is breakfast served and eaten?	Cafeteria Managers
• How much time is provided for students to eat breakfast?	Cafeteria Managers
• Is this time considered part of the school day?	Cafeteria Managers
• Is cafeteria seating capacity a constraint in the choice of breakfast setting?	Cafeteria Managers
• Where breakfast is eaten in the classroom, what are the mechanics of delivery, serving, trash removal, and record-keeping, and who is responsible for each task? Have there been problems associated with eating in the classroom? If so, how have they been resolved?	Cafeteria Managers; Teachers
Program Promotion	
• In what ways is the SBP publicized?	District Administrators; SFA Directors; Principals; Cafeteria Managers
• Are any special methods used to encourage student participation in the SBP?	Principals
• Through what means were universal-free school breakfasts explained to students and their parents?	SFA Directors; Principals
• Was there any follow-up publicity once universal-free school breakfast was underway?	SFA Directors
• What, if any, lessons were learned from the SY 2000-2001 program promotion experience?	SFA Directors
Cafeteria Operations	
• Do all students in the same school receive an identical breakfast?	Cafeteria Managers
• Is "offer versus serve" available?	Cafeteria Managers
• Is à la carte offered?	Cafeteria Managers
• Are hot meals served? If so, with what frequency?	Cafeteria Managers
• Are foods available from other on-campus sources during breakfast service?	Cafeteria Managers
• Who supervises the students during breakfast service?	Cafeteria Managers
• What menu planning system is used?	SFA Directors

Exhibit 2.1B

Operational Effects Research Questions

Topic/Question	Respondent/Data Source
Program Participation	
• How does the availability of universal-free school breakfast affect the rate of participation (share of students in attendance who receive a reimbursable school breakfast) in the school breakfast program?	SFA Directors; District Records
• How do the breakfast setting, the percent of students eligible for free and reduced-price meals, and the district affect the rate of participation in the school breakfast program?	District Records
School Operations	
• How does the availability of universal-free school breakfast affect: – the school day schedule? – bus schedules? – teacher perceptions of "school climate"? – time devoted to classroom instruction? – time required for administrative record-keeping? – teacher/principal perceptions of changes in student behavior, tardiness, attendance, and discipline?	Principals; Cafeteria Managers; Teachers
Cafeteria Operations	
• How does the availability of universal-free school breakfast affect: – the labor requirements of direct participants in the SBP (i.e. cafeteria workers, custodians, and supervisory staff)? – the composition of the breakfast menu? – where breakfasts are prepared? – time or length of breakfast service? – cafeteria manager perceptions of plate waste?	SFA Directors; Principals; Cafeteria Managers
Food and Nutrient Composition of School Breakfast	
• How does the availability of universal-free school breakfast affect: – the number and types of foods offered at school breakfast? – the food energy and nutrient content of school breakfast? – compliance with SBP nutrition standards and National Research Council recommendations?	Cafeteria Managers
Costs and Revenues	
• How does the availability of universal-free school breakfast affect: – the average cost of food per reimbursable meal? – the average cost of cafeteria labor per reimbursable meal? – the average federal reimbursement per reimbursable meal? – total federal reimbursement costs?	District Records
Stakeholder Attitudes	
• What do students attending schools participating in universal-free school breakfast like and dislike about school breakfast?	Students
• How does the availability of universal-free school breakfast affect: – the perception of principals of the attitude of key stakeholders toward the breakfast program? – the attitude of individual stakeholder groups toward school breakfast?	District Administrators; SFA Directors; Principals; Cafeteria Managers; Custodians; Teachers

- **Interviews with school principals**, both in person and by telephone, concerning school-level implementation decisions and perceived impacts;

- **Interviews with cafeteria managers**, both in person and by telephone, regarding school-level implementation, operational issues, and perceived impacts;

- **In-person interviews with teachers and custodians** regarding attitudes toward school meals, direct involvement with the SBP/universal-free school breakfast, and perceived impacts;

- **A self-administered survey of teachers** concerning school climate (e.g., absenteeism, tardiness, physical conflicts among students, student attitudes, and teacher morale);

- **A breakfast menu survey** (with in-person follow-up) **of cafeteria managers**, which includes five days of information on the types and amounts of foods in reimbursable breakfasts and counts of the number of breakfasts served;

- **Focus groups with students** regarding attitudes toward the SBP and universal-free school breakfast; and

- **School records** used to calculate school breakfast participation rates, including average daily attendance, number of breakfasts served for the school year, and number of breakfast serving days for school year (SY) 1999-2000, the baseline year, and SY 2000-2001, the first year of implementation of the pilot.

Data Collection

Sample

Data from the Implementation Study were collected using several different samples, depending on the stakeholder and the nature of the information being collected. Interviews were conducted with the entire universe of school district administrators (six), SFA directors (six), school principals (152), and cafeteria managers (153) taking part in the study. A sub-sample of 18 schools (three per school district, two treatment schools and one control school) received on-site visits as part of the Implementation Study. These schools were selected to be representative of other schools in the district. Where treatment schools were using innovative techniques, such as classroom breakfast, one of the treatment schools was selected from among those using such techniques. During the on-site visits, interviews were conducted with a sample of three teachers in each of the 18 schools (for a total of 54) and one custodian in each of 15 schools. The School Climate Survey was administered to a random sample of teachers (858) corresponding to the classrooms selected for the Impact Study sample (see Chapter Four). Focus groups were conducted in two schools (one treatment, one control) in each of the six districts. Each focus group included a purposive sample of 10 to 12 students in grades four through six.

Data Collection Time Line

Interviewers visited each of the six school districts for a five-day period in April 2001. Following completion of the on-site data collection, telephone interviews were conducted with the principals and cafeteria managers of the remaining schools in each school district. These interviews were supervised by project staff who had also participated in the on-site data collection and were therefore familiar with the districts and their policies and practices. The School Climate Survey and the Breakfast Menu Survey were administered between April and June 2001 in conjunction with the Impact Study data collection.

Analytic Approach

The analysis is divided into two parts; the first, which is descriptive in nature, describes the implementation process, and the second assesses the impact of implementation on school and school district operations and costs and the food and nutrient content of breakfasts offered. Analysis of the effects of universal-free school breakfast also focused on the analysis of differences among districts and between control and treatment schools.

Findings of the Implementation Study are presented in the next chapter. Detailed tables appear in Appendix A of this report. The instruments used in data collection are listed in Appendix H and are available on the Food and Nutrition Service website.

Chapter Three

Implementation of the School Breakfast Pilot Project

This chapter describes how the six school districts participating in the SBPP implemented universal-free school breakfast in their treatment schools and the effects of offering universal-free school breakfast on foodservice operations, costs, and the food and nutrient content of breakfasts served. Key findings from the Implementation Study include:

- Participation rates in the treatment schools (39 percent) were significantly[1] higher than in the control schools (23 percent). Among treatment schools, those that served breakfast in the classroom had significantly higher participation rates than those that served breakfast in the cafeteria or other location (71 percent versus 30 percent).[2]

- Implementation of the SBPP had little impact at the district level. Negative parental reactions or community problems were anticipated, but have not occurred.

- At the school level, the most notable impact of offering universal-free school breakfast has been the need for increased staffing. Increased participation led to a marked increase in workload for both cafeteria staff and those assigned to supervise students during breakfast.

- An analysis of the extent of choice and variety in breakfast menus revealed little difference between treatment and control schools. Differences in the types of foods offered were minimal and were limited to grains and breads.

- There was virtually no effect of universal-free school breakfast on the food energy or nutrient composition of the breakfast menus. The one statistically significant difference was a slightly lower mean cholesterol content for treatment schools.

- Based on an analysis of food and labor costs, treatment schools had average SBP costs per breakfast served that were 11 percent lower than control schools. A comparison of estimated receipts from federal reimbursements and revenue from paid breakfasts (control schools only) with food and labor costs for breakfast also indicated that treatment schools fared better than control schools.

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[1] Throughout the remainder of this report, "significant" refers to any statistically significant difference with $p < .05$.

[2] As used in this report, schools that "served breakfast in the classroom" refers to schools where breakfast was *eaten* in the classroom, though not necessarily *served* in the classroom. In some of these schools, breakfast is picked up in the cafeteria or elsewhere in the school and taken to the classroom where it is eaten.

- School breakfast generally receives high regard from school staff, parents, and students. Changes resulting from the SBPP were perceived differently by staff, parents, and students depending on how the individual stakeholder groups were affected.

As a backdrop, the chapter begins with a brief profile of the districts, describing their size and structure, their level of economic need, and organization and operation of their foodservice programs. The second section describes the decision-making process regarding participation in the SBPP and the implementation of universal-free school breakfast. The third section discusses the implementation process. This is followed by a discussion of the impact of universal-free school breakfast on school operations and costs. The final sections of the chapter discuss school climate and the perceptions of key stakeholders regarding the impact of universal-free school breakfast.

Description of District and School Characteristics

The school districts selected to participate in the pilot project were chosen by FNS on the basis of how closely they matched a carefully developed set of criteria. The intent was to include districts that provided a broad representation of economic and demographic make-up, urbanicity, and regional location. In each participating school district, the pilot was limited to elementary schools. In a few instances, for purposes of the study, schools with more limited grade configurations were combined, generally with "feeder" schools (e.g., K-3 and 4-6), and treated as if they were a single school. Schools that did not have an ongoing School Breakfast Program (SBP) or were operating their meal programs under Provision 2 or Provision 3 were excluded from the project. The selection of districts was constrained by the legislative guideline that the pilot be limited to six districts and by those districts that applied to participate. Despite these constraints, the six districts are in combination reasonably representative of the universe of all SBP schools in terms of enrollment size, share of students eligible for free and reduced-price meals, share of students participating in school breakfast, and urbanicity. Exhibit 3.1 summarizes the characteristics of the six school districts participating in the SBPP.

Size and Structure

On the basis of their overall student enrollment, all six districts rank among the largest 6 percent of public elementary and secondary school districts nationally.[3] Nevertheless, there was a considerable range in size among the six districts. The total enrollment of the six school districts (including both elementary and secondary schools) ranged from about 12,000 in Harrison County to nearly 50,000 in Wichita. In terms of the total enrollment of elementary schools participating in the SBPP, the districts ranged in size from less than 5,000 in Santa Rosa to more than 20,000 in Wichita.

Four of the participating districts (Boise, Santa Rosa, Phoenix,[4] and Wichita) are urban districts, while the remaining two districts (Harrison County and Shelby County) serve entire counties covering large geographic areas. Both districts contain several small towns and relatively large expanses of open country.

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[3] The largest 6 percent of all public elementary and secondary school districts account for about half of total national enrollment.

[4] The Washington Elementary School District, or Phoenix as it is called in the remainder of this report, is located in an urban setting serving Northwest Phoenix and parts of Glendale, Arizona.

Exhibit 3.1

Selected Characteristics of Elementary Schools Participating in the School Breakfast Pilot Project, by District, SY 1999-2000

Characteristic	Boise	Shelby County[1]	Harrison County	Phoenix	Santa Rosa	Wichita
Number of schools in the evaluation						
Treatment	17	8	5	12	5	32
Control	17	8	5	12	5	27
Total	34	16	10	24	10	59
Total enrollment	14,362	9,739	7,899	15,586	4,364	24,508
Percent of elementary school students approved for free and reduced-price meals[2]	34%	24%	62%	48%	70%	59%
Range in free and reduced-price eligibility among elementary schools in the district	2 – 83%	3 – 65%	34 - 84%	10 – 94%	21 – 98%	18 – 100%
Percent of schools qualifying as severe need[3]	50%	25%	90%	58%	100%	80%
SBP participation rate (SY 1999-2000)[2]	9%	21%	33%	21%	25%	24%
District area (square miles)	46	795	581	44	34	136

[1] Two schools were new and did not have data in school district files; school-level data for SY 1999-2000 were used.
[2] Percent is weighted for enrollment in each school.
[3] Severe need data were collected from school district files, SY 2000-2001.

Sources: *Impact Study – School District Files, SY 1999-2000 and U.S. Census Bureau: County and City Data Book, 1990 and State and County Quick Facts, 2000 (district area data)*

Eligibility for Free and Reduced-Price Meals

The number of students eligible for free and reduced-price meals is frequently used as an indicator of the level of economic need within a student population. Nationally, around 42 percent of all students enrolled in public elementary and secondary schools are approved to receive free (household income at or below 130 percent of the federal poverty guideline) and reduced-price (household income between 130 and 185 percent of poverty) meals. Of the six school districts with elementary schools participating in the pilot, two are below the national average. They are Shelby County (24 percent) and Boise (34 percent). In participating schools in the other four districts, the percentages of students approved for free and reduced-price meals are above the national average: Phoenix (48 percent), Santa Rosa (70 percent), Wichita (59 percent), and Harrison County (62 percent).

There is also substantial variation in the proportion of students approved for free and reduced-price meals among the schools within each district, indicating that within each district there are areas of relatively severe economic need as well as areas of relative prosperity. Even in the more prosperous school districts, there are schools that qualify as "severe need".[5] Among the 153 schools participating in the SBPP, 101 (66 percent) were designated as severe need in SY 2000-2001. Nationally, 60 percent of all public elementary and secondary SBP schools qualified as severe need in SY 2000-2001.[6]

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[5] A school qualifies as a severe need school if: (a) the cost of producing a breakfast exceeds the normal reimbursement rate, and (b) 40 percent or more of the lunches served to students at the school in the second preceding school year were served free or at a reduced-price.

School Food Authority Organization and Operation

School Food Authorities (SFAs) are responsible for operating school district food programs. Typically this involves menu planning, food procurement, and staff recruitment, training, and supervision. Though most SFAs perform these functions through a central foodservice office, some SFAs delegate at least some of these functions to the individual schools within their district. SFAs must comply with NSLP and SBP policies and regulations, which are monitored by the cognizant State Child Nutrition Agency. This includes responsibility for determining students' eligibility for free and reduced-price meals, serving meals that meet prescribed nutrition standards, and record-keeping required to receive reimbursement for qualifying meals.

Each of the six districts participating in the pilot was led by an experienced SFA director, with length of tenure ranging from 10 to 30 years. Administratively, while the SFA directors in these districts report to the school district superintendents, they are in fact directly supervised by someone other than the superintendent. For the larger districts, the SFA director reports to the district business office. For the smaller districts, the SFA director reports to an assistant superintendent. In practice, the mission of the SFA is sufficiently unique and specialized that, aside from major budgetary and policy issues, they are generally left to function more or less autonomously.

Within the school foodservice operations, the line of authority runs from the SFA director to the cafeteria managers at the individual schools. The larger districts have area or regional supervisors who report to the SFA and provide day-to-day supervision of the cafeterias under their jurisdiction. Cafeteria staffing is dependent on the level of NSLP and SBP participation and on the labor requirements of the menus that are served. Many of the staff are part-time. The number of staff preparing and serving breakfast ranged from one to six per school in the SBPP schools.

The Decision-Making Processes

Implementation of the SBPP involved a hierarchy of decisions occurring at different levels within each district. Three relatively distinct decisions or decision sets were involved. First, there was the decision of the district to apply to participate in the pilot and, once selected, to agree to take part in it. Second, once the district had committed to taking part in the project, there were several critical implementation decisions (e.g., location of breakfast service, breakfast schedule, supervision, etc.). These decisions were generally delegated to the schools within each district. School principals, in particular, made many of the critical choices at this stage. Third, there were also the ongoing decisions required for the day-to-day administration of school breakfast (e.g., the choice of menu items and whether to offer foods on an à la carte basis). Although these decisions are largely independent of the SBPP, they can affect its implementation. Furthermore, there are some important differences among the six participating districts in how they administer the program and, therefore, on how they approached implementation.

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[6] FNS National Data Bank.

In the remainder of this section, we examine these decision processes in more detail.

District Decision to Participate

Factors Involved in the Decision

The decision to take part in the pilot generally involved both the SFA director and school district administrators.

- **SFA Directors.** Of those involved in the decision, the SFA directors were almost always the key driving force. In four of the six districts, the decision to apply originated with the SFA director in response to FNS' announcement of the SBPP. In one district, the decision process was initiated by the SFA director after the State Child Nutrition Agency brought the SBPP to the district's attention. The remaining district applied at the urging of the district's Congressional Representative, a sponsor of the legislation authorizing the pilot. In all six districts, it was the SFA directors who prepared the applications and assembled the supporting documentation.

- **School District Administrators.** FNS' application package included a letter, to be signed by the school district's governing body, stating that the district agreed to all of the terms of participation in the demonstration (e.g., random assignment of schools to treatment and control groups, participation in the evaluation, etc.). In five of the six districts, final approval was given by the Superintendent or the School Board or a combination of the two. In the remaining district, approval was granted by the Executive Director of the Office of Business Services.

  Each of the six districts involved at least one school district administrator in the application process. In most districts, this role was assigned to an Assistant Superintendent (or equivalent) with limited knowledge of or direct experience with the school meal programs. For the most part, the district administrators viewed their role in the process as representing the interests of the district's principals and teachers (i.e., making certain that participation in the demonstration would not impose a significant burden). However, district administrators in four of the six districts characterized their role as "strongly supportive" of the district's bid to participate and played an important role in garnering district support for participation in the demonstration. In only one district did the district administrators indicate that they played a minimal role in the application process.

Factors Involved in the Application Decision

Among districts participating in the pilot, the principal motivation behind their applications was the desire to increase participation in the SBP among needy students. In addition, four of the six SFA directors had long supported the concept of a universal-free school breakfast, with two of the directors indicating that they had tried it on a limited scale in their districts in the past. The other two SFA directors viewed the demonstration as an opportunity to determine whether there is a measurable relationship between nutritional well-being and academic achievement.

While two of the six SFA directors were sufficiently convinced of the merits of the demonstration that they saw no downside to participating and could not identify any potentially adverse consequences of participation, the other four SFA directors expressed several concerns about participation. Heading the list of concerns was the possibility of adverse parental reactions. Two directors worried that parents in their districts would view the demonstration as an invasion of parental responsibility. Another director was concerned that parents of students in control schools would object to the absence of free breakfasts in their child's school while they were available to students attending other nearby schools.

Other potential concerns expressed by the SFA director and/or district administrators in these four districts included:

- The need for additional staff to prepare, serve, and supervise an increased number of breakfasts;
- Insufficient cafeteria space to accommodate the larger volume of students having breakfast at school;
- Effects of the demonstration on class and bus schedules and on instructional time;
- Increased teacher workload;
- Erosion of control by school principals over their school's operation; and
- What would happen at the end of the demonstration (i.e., whether the district could continue to provide universal-free school breakfasts, and, if so, how to pay for them).

School-Level Implementation Decisions

Three key operational issues for serving school breakfast are:

- Where breakfast is to be served;
- When breakfast is to be served; and
- How much time is to be allotted for breakfast?

Most school districts participating in the SBPP left these decisions to the individual school principals. Under the demonstration, while it was requested that control schools continue to operate the SBP as before, they were left free to implement changes in their school breakfast program short of offering universal-free school breakfast. For example, they were free to change when or where breakfast was served. To a great degree, for the treatment schools, the anticipated increase in breakfast participation necessitated revisiting these issues.

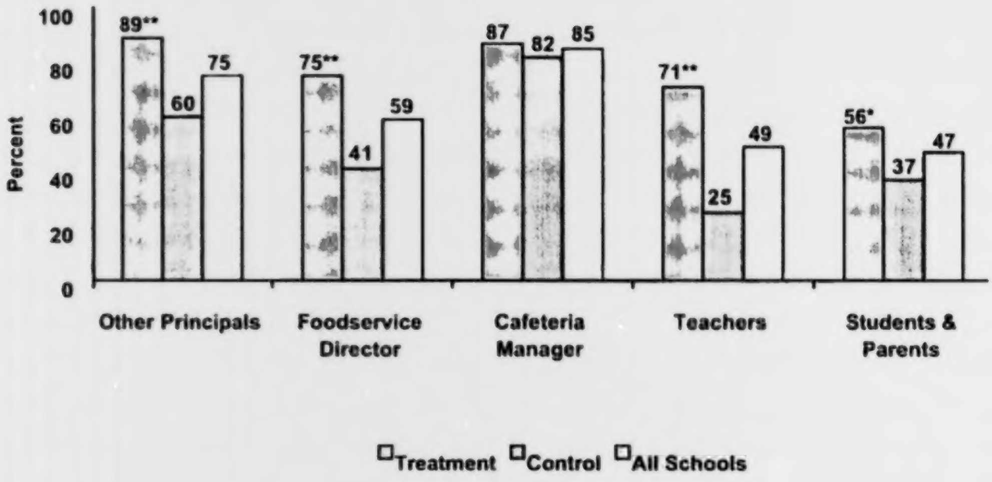
With the exception of one district, where the decision to serve breakfast in the classroom was made at the district level, all six of the demonstration districts left it to the principals to make the decisions regarding each of these issues. It is not surprising, then, that nearly three quarters of treatment school principals indicated that they had substantial or full autonomy with regard to the breakfast program in their schools (Exhibit A-21). Only one half of the principals in the control schools indicated that they had substantial or complete autonomy. One third of the control school principals believed that they had little, if any, autonomy. Much of the difference in perception between control and treatment school principals is probably due to the opportunity that most treatment school principals had to determine how universal-free school breakfasts were going to be provided in their schools in SY 2000-2001. Some control school principals might also have felt that their exclusion from universal-free school breakfast left them with little opportunity to affect the operation of the program in their schools compared to the opportunity for change in treatment schools.

Regardless of how much control principals believed they exercised over the school breakfast in the first year of the pilot project, over 90 percent of *all* principals said that they considered it the responsibility of the individual school to determine when and where breakfasts were served in that school (Exhibit A-22). Menu planning, on the other hand, is almost exclusively the responsibility of the SFA director. Thus, while principals exercise no direct control over the composition of the meals, it is widely understood that they have a lot to say about the location and timing of meal service.

Treatment school principals overall were substantially more engaged in working with key stakeholders than were control school principals. For example, while 25 percent of control school principals said that they work with teachers in overseeing the program, 71 percent of the principals in treatment schools said they involved teachers (Exhibit 3.2). Compared to their colleagues in control schools, a significantly larger share of treatment school principals said that they consulted with or worked with: other principals, the district foodservice director, teachers, students, and parents in overseeing school breakfast.

Exhibit 3.2

Share of Principals by Who They Worked With in Overseeing School Breakfast, SY 2000-2001



N = 152

* Difference between treatment and control schools is statistically significant at the .05 level.
**Difference between treatment and control schools is statistically significant at the .01 level.

Source: *Implementation Study – School Principal Interview, Spring 2001*

School-Level Management of the Breakfast Program

Principals

While principals are the primary decision-makers regarding school breakfast implementation issues in their schools, very few appear to exercise a direct, hands-on role in the cafeteria operations in their schools on a regular and continuing basis. In this regard, there are no significant differences between treatment and control schools. Only 9 percent of principals involve the cafeteria manager in school-wide staff meetings, and only 28 percent receive written or oral reports from the cafeteria manager on a regular basis (Exhibit A-11). For the most part, principals get involved only when it is necessary to resolve foodservice issues. Nearly three quarters (74 percent) of principals indicated that they meet with the cafeteria manager to resolve issues. Similarly, although most principals report having some direct contact with the SFA director in their district, for the majority of principals it is infrequent. This is true for principals in both treatment and control schools. Nearly two thirds (65 percent) of all principals reported having contact with the SFA director no more often than once every three months, and 18 percent indicated that they never or almost never had contact (Exhibit A-10).

Principals were primarily concerned with six issues related to the implementation of the SBPP in their schools (Exhibit 3.3):

- Minimizing non-teaching time (54 percent);
- Supervision of students during breakfast (42 percent);
- Bus schedules (36 percent);
- Labor and facility requirements for food preparation (34 percent);
- Making effective use of limited space (34 percent); and
- Demands on custodial services for clean-up (32 percent).

Significantly more treatment school principals than control school principals were concerned with minimizing non-teaching time (62 percent versus 45 percent); food preparation requirements (44 percent versus 23 percent); and clean-up (41 percent versus 23 percent).

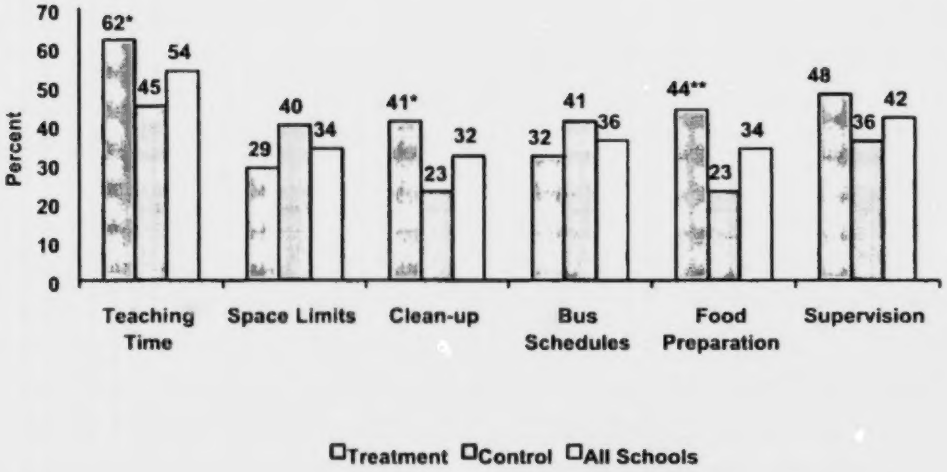
Among treatment schools, it is noted that a larger share of the principals from schools serving breakfast in the classroom as compared to those serving in the cafeteria identified "space limitations" as an important consideration (50 percent versus 23 percent; Exhibit A-24). The difference is significant at the .05 level. Of the several factors that might have led treatment schools to choose classroom feeding, it is possible that this is one of the more influential. Another potentially important factor leading to this decision might have been a concern over providing breakfast supervision. Of those schools that decided to serve breakfast in the classroom, 61 percent indicated that this was an important consideration, compared to 44 percent of treatment schools serving in the cafeteria.

SFA Directors and Cafeteria Managers

The day-to-day operation of the foodservice program is largely under the purview of the SFA directors and the cafeteria managers that report to them. The degree to which these decisions were centrally made versus being made by cafeteria managers in the schools was found to vary among the districts. In five of the six districts, most of the key decisions, including menu planning, procurement, and hiring were centralized. In the one district where these decisions were made at the school level, a state requirement calls for districts to maintain "site control." In this district, area

Exhibit 3.3

Considerations Important to Principals in Making Decisions Regarding the SBPP in SY 2000-2001



N = 152

*Difference between treatment and control schools is statistically significant at the .05 level.
**Difference between treatment and control schools is statistically significant at the .01 level.

Source: Implementation Study – School Principal Interview, Spring 2001

managers, working under their SFA director, are responsible for menu planning, while cafeteria managers place their own food orders, and principals hire cafeteria staff and process free and reduced-price school meal applications.

Although the responsibility for menu planning primarily rests with the SFA directors, cafeteria managers exercise considerable discretion independent of central authority. As a result, the composition of menus is influenced by a combination of factors including the preferences of cafeteria workers for particular foods, whether breakfast is being served in the cafeteria or in the classroom, and the tastes and preferences of the students.

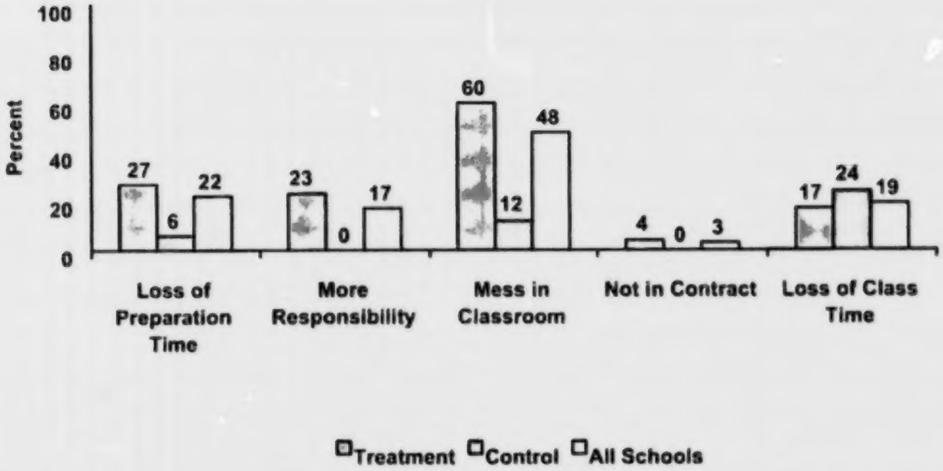
Teachers

While treatment school principals were far more likely to involve teachers in school breakfast decisions than were principals in control schools (66 percent versus 23 percent), there were no major differences in how principals sought input from their teachers. Most often, principals received teacher input regarding school breakfast through "informal consultation" (42 percent) or during staff meetings (28 percent; Exhibit A-25). Only 16 percent of the principals that sought input from their teachers did so through use of established committees.

A substantially larger share of all treatment school principals, including both those providing breakfast in the cafeteria and those providing breakfast in the classroom, reported that their teachers had voiced concerns about the breakfast program in their school. For the most part, control school principals that sought teacher input on the breakfast program indicated that the only notable concern expressed by their teachers was the disruption to, and loss of, classroom time (24 percent). While treatment school principals indicated that their teachers were also concerned with this issue (17 percent), other issues regarding the breakfast program had a higher incidence of teacher concern (Exhibit 3.4). The major areas of concern for treatment school teachers were: mess in the classroom (60 percent), loss of classroom preparation time (27 percent), and the additional responsibilities that the breakfast program placed on teachers (23 percent).

Exhibit 3.4

Teacher Concerns with School Breakfast, as Reported by School Principals, SY 2000-2001



N=152

Source: Implementation Study – School Principal Interview, Spring 2001

Implementing the Universal-Free School Breakfast Program

The timeline for implementing the School Breakfast Pilot Project was very compressed, leaving most districts with three to five weeks between the orientation/training session and start of the school year. The SBPP began in December 1999 with an announcement in the Federal Register which included an application package for school districts that were interested in participating in the SBPP. Applications were due on January 31, 2000. FNS received application packages, including letters of agreement, from 386 school districts. The six participating school districts were announced by FNS on May 15, 2000. The evaluation contract was awarded on June 26, 2000, and an orientation/training session for the six districts was conducted on July 21-22, 2000. The SFAs were notified of the control and treatment school assignments between June 19 and June 30, 2000.

Evaluation site visits began in August 2000. The 2000-2001 school year started in some districts in mid-August. This section describes the implementation process.

Training and Orientation

The two-day orientation meeting for school district representatives in July 2000 was held in Washington D.C. It was attended by the SFA director and a district administrator from each district. This meeting afforded district representatives their first detailed look at the demonstration and how it would be conducted and evaluated.

During August and September, representatives of the evaluation team visited each of the six school districts to conduct orientation sessions. During these visits, briefing sessions were held with the principals and designated liaisons for all schools participating in the evaluation, both control and treatment.

In most respects, the demonstration required no change from past practices. Breakfasts served by participating schools had to meet the same FNS requirements as those served under the regular SBP. For treatment schools, the only required change was that all breakfasts now be served free of charge. While no changes were expected in the control schools, some changes were expected in treatment schools. It was expected that some treatment schools might need to make changes in order to accommodate an anticipated increase in program participation. Nearly one quarter (23 percent) of the treatment schools made changes in the breakfast setting, shifting the location where breakfasts were eaten from the cafeteria to the classroom.

Staff orientation and training is a normal part of school operations. However, given the implementation of universal-free school breakfast in treatment schools in SY 2000-2001, a significantly higher proportion of treatment schools conducted orientation/training sessions for their staff regarding school breakfast than did control schools (81 percent versus 53 percent; Exhibit A-26). This difference reflects the need to provide an orientation on universal-free school breakfast for school administrators and teachers at the beginning of the school year. There was also a need in both treatment and control schools for school principals and teachers to be made aware of the SBPP and its implications for their schools, especially the evaluation activities that would be occurring as part of the demonstration.

Five of the six SFA directors reported that they had conducted training/orientation sessions for their foodservice workers. In some districts, a SBPP orientation was made part of the annual training program. In other districts, sessions were held exclusively to discuss the pilot. In three districts, both school principals and foodservice staff took part in these sessions. To the extent SFAs noted shortcomings in these sessions, they were generally attributed to the rapid start-up required to get the program in place by the beginning of the school year.

Although training/orientation sessions for foodservice workers were conducted in the majority of school districts, only 31 percent of cafeteria managers indicated that they had attended such sessions in SY 2000-2001, with no significant differences between treatment and control schools (Exhibit A-43). Of those cafeteria managers who took part in these training/orientation sessions, only 30 percent indicated that the session included material on universal-free school breakfast, with no significant differences between treatment and control schools. It was believed that training related to specific aspects of implementing universal-free school breakfast was not needed.

Program Promotion

School District Concerns

The promotion of universal-free school breakfast posed a dilemma for at least some of the participating districts. On one hand, all of the districts sought to use the demonstration to increase school breakfast participation. On the other hand, SFA directors in some districts were concerned about the possible adverse reactions of some parents. As a result, there was reluctance on the part of some administrators to promote the pilot beyond informing parents and students of its availability.

The source of concern varied among districts. There was apprehension in at least one district that some parents would view the demonstration as infringing on parental responsibility. In still another district, the issue of childhood obesity was being prominently featured in the media and in the state legislature. In this context there was concern that a program of universal-free school breakfasts might be viewed as contributing to the problem of childhood obesity. There was also worry that parents of students attending control schools might object to their children not receiving free breakfasts. There were, therefore, some relatively strong disincentives to aggressive promotion of the program. However, despite the expressed concern of the school districts, there is no evidence of any negative reaction from control school parents.

Promoting School Breakfast

SFA directors, school principals, and cafeteria managers were actively engaged in promoting the SBP and universal-free school breakfast. The SFA directors were generally responsible for planning and developing materials while the dissemination of promotional materials was left largely to the principals and cafeteria managers. When special promotional methods were used, these were generally initiated by school principals.

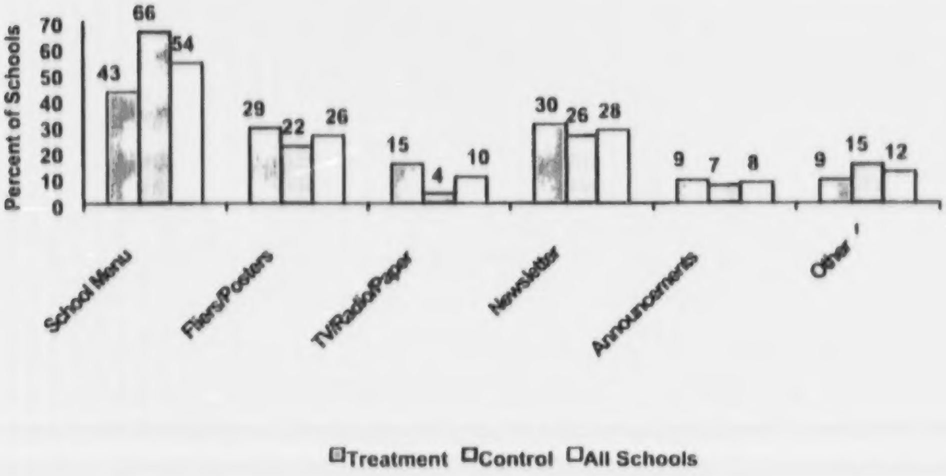
The districts were equally divided in whether they used the same promotional materials in both treatment and control schools. Three SFA directors said they used the same materials in all their schools while the other three said they used different materials. One of the directors that used different materials said that the district had purposely adopted a low profile in promoting the demonstration. When asked if they had engaged in any follow-up publicity once the demonstration was underway, only one of the six SFA directors responded in the affirmative. When asked if there was anything they would have done differently in promoting universal-free school breakfast, two SFA directors responded that they would have made a greater effort to promote the program among teachers.

While a substantially larger share of treatment school than control school principals indicated that they had made a special effort to publicize the breakfast program in SY 2000-2001 (44 percent versus 12 percent; Exhibit A-38), it is interesting to note that despite a fundamental change in the program, less than half of the treatment school principals engaged in such an effort.

A variety of methods were used by cafeteria managers to publicize school breakfast (Exhibit 3.5). The most frequently used means were menus (54 percent), newsletters (28 percent), and fliers/posters (26 percent). Control schools used school menus with somewhat greater frequency than treatment schools (66 percent versus 43 percent), although this was the favored method of both. Neither control

Exhibit 3.5

Means of Publicizing School Breakfast as Reported by Cafeteria Managers, SY 2000-2001



N=153

[1] Other included: explanations in student handbook; telephone messages; special events; and give-aways.

Source: *Implementation Study – School Cafeteria Manager Interview, Spring 2001*

nor treatment schools used television, radio, or newspapers extensively, although treatment schools used them more often (15 percent versus 4 percent). Principals used newsletters more than anything else (Exhibit A-38).

Breakfast Setting

In most schools, breakfasts are served and eaten in the same location as lunches, usually the cafeteria. However, for at least a couple of reasons it was anticipated that some treatment schools might choose to serve their breakfasts in another location, perhaps in the classroom. One reason was the possible lack of sufficient seating capacity in the cafeteria. In serving lunch, schools are able to avoid this constraint by staggering lunch periods. It is not unusual for schools to have two or three sittings at lunch.

With breakfast, however, this is often not feasible given that breakfasts are generally not part of the school day and the period of time breakfasts are made available is therefore limited. In addition, during the initial SBPP orientation, SFA directors and school district administrators were informed about the results of previous demonstrations of universal-free school breakfast which indicated that breakfast participation rates increased substantially when breakfasts were made available to students in the classroom rather than the cafeteria.

Of the 79 treatment schools, 18 schools (23 percent) chose to have breakfast served only in the classroom, while another two schools adopted a combination of approaches with some classes eating breakfast in the classroom and some in the cafeteria (Exhibit A-45). A major factor working against shifting the location of breakfast service was the relatively short period of time available to make the shift. As noted previously, at the time of the orientation meeting in July 2000, some districts were only three weeks away from the opening day of classes for SY 2000-2001. At this meeting several districts indicated that a shift in the location of breakfast service was simply not feasible for the upcoming school year. Some districts indicated that administrative issues regarding their participation in the pilot were consuming all of their available time, leaving little, if any, time to plan for logistics of changing the breakfast setting (let alone getting the buy-in of principals, teachers, and other school staff).

Of the 20 schools[7] where students ate breakfast in the classroom, 10 schools delivered food to the classroom (using designated students or staff). In the remaining schools, students picked up their breakfasts elsewhere, usually in the cafeteria, and brought them to the classroom to eat. In the remaining 59 treatment schools, breakfast continued to be eaten in the same locations as before, usually the cafeteria or a multi-purpose room. The 73 control schools continued to use the same locations they had used prior to the pilot. This includes two control schools that provided breakfast in the classroom because of special circumstances.

For those treatment schools that shifted to serving breakfast in the classroom, new procedures were required. At a minimum, they had to make different arrangements for:

- The delivery of food to the classroom;
- Serving students;
- Trash collection from multiple locations; and
- Record-keeping.

It was left to each school to develop its own procedures for the accomplishment of these tasks. In 14 of the 20 schools[7] where students eat breakfast in the classroom, students pick up their breakfast in the cafeteria or gym and bring it to the classroom to eat (this includes some schools where designated students from each class are responsible for picking up the food in the cafeteria and bringing it to the classroom). In all but one of the remaining schools, food is delivered to the classroom by foodservice staff. In one school, breakfast is brought to the classroom by teachers. In most cases, once the food has reached the classroom, students serve themselves. In a few cases, particularly in the lower grades, teachers assist in serving the breakfasts.

Trash disposal is generally a shared task with students disposing of trash at a central location in or near their classrooms. Trash is then collected from these central locations. In about two thirds of the schools, trash is collected by school custodians (Exhibit A-48). In two schools, trash disposal is the responsibility of teachers. In one school district, cafeteria staff are responsible for breakfast trash disposal in all the district's schools, regardless of where breakfasts are eaten.

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[7] Includes 18 treatment and 2 control schools.

Cafeteria Operations

Regulations issued by the USDA's Food and Nutrition Service establish many of the procedures that must be followed in administering the SBP. Nonetheless, there remains the opportunity for choice in many dimensions, including, for example, the choice and variety of foods to be offered, whether foods are offered on an à la carte basis, and whether "offer versus serve" is used. In this section, we compare the cafeteria operations of control and treatment schools. Findings are shown in Exhibit 3.6 and Appendix A exhibits, as noted.

Exhibit 3.6

Comparison of Characteristics of Cafeteria Operation, SY 2000-2001

Characteristic	Treatment Schools	Control Schools	All Schools
		Percent of Schools	
Offer versus serve available	68*	82	75
À la carte offered	33*	50	41
Identical breakfasts served within school	92	97	95
Hot meals served, at least occasionally	60	61	60
Foods available from other on-campus sources	15	12	14

N=153

* Difference between treatment and control schools is statistically significant at the .05 level.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Past Experience with the SBP

Virtually all (98 percent) of the cafeteria managers indicated that, in their opinion, the breakfast program had operated relatively smoothly in the years prior to the demonstration (Exhibit A-40). Of those cafeteria managers who identified past problems with the program, 28 percent indicated that low program participation was a problem. Other shortcomings included: scheduling conflicts (12 percent), a perception of the SBP as a welfare program (9 percent), and staffing problems (9 percent). There were no significant differences between treatment and control schools in terms of their past experience with the SBP.

Offer Versus Serve at Breakfast

To avoid unnecessary waste, schools may allow students to refuse a limited number of foods offered from among those required to qualify as a reimbursable meal. The approach, called "offer versus serve," is adopted at the discretion of the school food authority for the SBP. A large majority of both control schools and treatment schools allowed their students to exercise this option, 82 percent and 68 percent, respectively (Exhibit A-51). This difference is explainable by the limited use of this option in treatment schools in which breakfast is eaten in the classroom. Only six of the 18 treatment schools serving breakfast in the classroom provided offer versus serve. It would appear that the logistics of delivering food to individual classrooms is probably an impediment to the use of this option.

Availability of À la Carte Items at Breakfast

Another option that some schools offer their students is the opportunity to buy individual food items à la carte. When offered, these items may be purchased in addition to, or instead of, the reimbursable meal. While relatively few schools offer à la carte items at breakfast, significantly fewer treatment schools (33 percent) offered à la carte items at breakfast than control schools (50 percent). Again, the difference is almost entirely due to the fact that only 2 of the 18 treatment schools where breakfast is eaten in the classroom have à la carte items available (Exhibit A-51). Schools that offer à la carte items at breakfast almost always serve milk (91 percent) and juice (78 percent), while 40 percent offer an entrée. There are no differences between the treatment and control schools in terms of the items that are available à la carte.

Availability of Hot Meals at Breakfast

Nearly all of the participating schools, whether control or treatment, reported that they served an identical breakfast to all the students in their school (Exhibit A-51). Most schools (60 percent) served hot breakfast (from one to two times a week only during cold weather to every day) with no significant differences between treatment and control schools.

Other On-Campus Sources of Food when Breakfast is Served

In only 14 percent of schools were foods available from other sources (such as in vending machines or from school stores) when breakfast was being served, with no significant differences between treatment and control schools (Exhibit A-53).

Breakfast Supervision

Schools commonly make different arrangements for supervising students while they eat breakfast, depending on staff availability and local practices. Across all schools participating in the SBPP, staff used in this capacity with greatest frequency in SY 2000-2001 were: teachers (39 percent), foodservice staff (36 percent), teacher assistants (20 percent), and custodians (17 percent). There were no significant differences between treatment and control schools in the type of staff supervising students at breakfast (Exhibit A-47).

Implementation Problems

Beyond the problems anticipated in advance of their decisions to participate, SFA directors were asked if any additional problems had arisen once the district had been selected to take part in the SBPP. Five of the six reported that additional problems had arisen during SBPP start-up. For the most part, these problems grew out of misunderstandings and miscommunications that occurred within the districts. Anecdotally, some districts indicated that some of these misunderstandings or miscommunications were brought about by the limited time allowed for getting underway.

SFA directors in three districts reported that the reservations of some school and district administrators only became evident as the time for implementing the pilot neared. The basis of their reservations varied from district to district. In one district, replacement of the superintendent and an assistant superintendent who had been instrumental in promoting the district's application resulted in a breakdown in communication. In another case, the random assignment of higher-income schools as treatment sites, coupled with a concern that parents would object to their children being encouraged to eat school breakfasts, caused district administrators to have second thoughts about going ahead with the demonstration.[8] However, following consultation with FNS staff and with representatives of the evaluation team, these problems were resolved and all of the districts initially selected to participate in the pilot elected to remain in the study.

Three districts reported that they experienced various operational problems during start-up. For one district, it was figuring out how to serve so many students during a compressed period. For another district, the main problem was one of finding additional staff for breakfast supervision.

District administrators were also asked for their views of the decision to participate in the pilot and what considerations were most important to them. To them, the single most important factor driving the decision to participate was achieving improved "program performance." For some, this meant improved academic achievement, while for the others it meant increased participation in the SBP. In only one district did the district administrator emphasize the potential drawbacks of participating in the pilot over the potential benefits.

Impact of Implementing Universal-Free School Breakfast on School Operations and Costs

This section examines the impact of universal-free school breakfast on the operation of the school districts and schools taking part in the SBPP. We begin with an analysis of program participation, comparing the rates of participation of control and treatment schools in the base year, SY 1999-2000, and in the first year of the pilot, SY 2000-2001. To the extent that there are changes in the rate of participation, they are likely to drive many of the operational changes that may occur. Here we examine the impact of universal-free school breakfast on operations, both at the school level and in the cafeteria, on school schedules, staffing requirements, the composition of breakfasts served, food and labor costs, and reimbursement receipts. The section concludes with impacts on school climate and a review of stakeholder perceptions.

Program Participation

As described in Chapter One, participation in the SBP has historically been low when compared to participation in the National School Lunch Program (NSLP). In SY 1999-2000, nationally, an estimated 18 percent of students enrolled in schools offering the SBP participated in the program,[9] compared to 56 percent in the NSLP. In SY 1999-2000, the year preceding implementation of the pilot project, an average of 20 percent of students enrolled in the schools taking part in the SBPP participated in the breakfast program, with no significant differences between treatment and control schools (Exhibit 3.7).[10] While participation rates in the control schools remained essentially unchanged, breakfast participation rates in treatment sites nearly doubled during the first year of the SBPP, climbing from 21 percent to 39 percent. Among the treatment schools, participation rates in

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[8] Although schools were paired on the basis of their similarities with regard to characteristics such as the percentage of students participating in the breakfast program, average scores on achievement tests, and the percentage of students certified to receive free and reduced-price meals, the assignment of paired schools between control and treatment was strictly random.

[9] This estimate is based on data from the FNS National Data Bank and from Promar International, 2002. Enrollment in SBP elementary and secondary schools in SY 1999-2000 is estimated to be 42 million.

[10] Participation rates reported here have been adjusted for student attendance.

Exhibit 3.7

Comparisons of the Average Rate of Participation in the School Breakfast Program, SY 1999-2000 and SY 2000-2001[1]

School Type	N	Mean Percent Participation	
		SY 1999-2000	SY 2000-2001
Treatment	79	21	39**[a]
Non-classroom (cafeteria)	61	19	30**[b]
Classroom	18	29	71
Control	74	20	21
All	153	20	31

[1] Participation rates have been adjusted for student attendance.

** Difference is statistically significant at the .01 level.

[a] Comparison is between treatment and control schools.

[b] Comparison is between classroom and non-classroom treatment schools.

Source: Impact Study – School-Level Data, SY 1999-2000 and SY 2000-2001

schools that served breakfast in the classroom had markedly higher participation rates than those that served breakfast in the cafeteria (71 percent versus 30 percent). This is consistent with previous demonstrations of universal-free school breakfast in Minnesota (Wahlstrom et al., 1997) and Maryland (Abell Foundation, 1998).

District and School Operations

In this section, the impact of offering universal-free school breakfast on district and school operations is examined. Since nearly all of the changes associated with the SBPP occurred in the schools, this is the main focus of this section. Before turning to the impact on school operations, district-level views of the SBPP and the effect of impacts at this level are described.

District Impacts

As noted above, concerns had been voiced in some districts during start-up that some parents might object to the program. Some feared that parents might view free breakfasts as an intrusion on parental responsibility. Others were concerned that parents of students in control schools might object to their children having to pay for the breakfasts while children in other (treatment) schools did not have to pay. Despite these early concerns, there were no major parental or community problems as the pilot got underway. To the contrary, most of the administrators expressed surprise and pleasure at just how smoothly implementation had gone from their perspective.

Five of the six school district administrators indicated that implementation of universal-free school breakfast had no effect on district administration. One administrator indicated that there had been a small budgetary impact, a slight increase in cost due to additional breakfast supervision. For the most part school district administrators indicated that, during the first year of its implementation, the availability of universal-free school breakfast had no noticeable educational impact in their districts. Four of the six administrators indicated that they were unaware of any impact or that it was too early to know. An administrator in one of the other two districts observed that the pilot was going well, and that he had been told that absences and tardiness were down in the treatment schools. The

administrator of the remaining district said that there had been some loss of instruction time in those schools serving breakfast in the classroom, though it was not considered a major problem.
In general, the district administrators were pleased with universal-free school breakfast. Four of the six administrators indicated that if they had it to do all over again, they would still participate in the SBPP (Exhibit A-6). The other two administrators, while pleased with universal-free school breakfast, were not certain that they would again make the decision to participate in the SBPP because of the burden of the data collection for the evaluation.

School Impacts
There were few noteworthy changes in school operations that resulted from the implementation of universal-free school breakfast. One major impact was on staffing, with over one third (37 percent) of treatment school principals reporting an increase in staffing between SY 1999-2000 and SY 2000-2001 (Exhibit 3.8). By contrast, only 6 percent of control school principals reported such an increase. Cafeteria workers and custodial staff were most affected by the implementation of universal-free school breakfast. Most principals indicated that the workload of cafeteria workers and custodial staff had increased. More than two thirds (69 percent) of treatment school principals reported an increase in the workload of cafeteria workers, and 60 percent reported an increase in the workload of their custodial staff (Exhibit A-28). In addition, 42 percent of the treatment school principals reported an increase in the workload of school office staff and 30 percent in the workload of teachers. As one would expect, the increase in the workload of teachers was concentrated in the treatment schools where breakfast was eaten in the classroom (14 of the 18 treatment schools serving breakfast in the classroom reported an increase in teachers' workload; Exhibit A-29). In addition, more than half (56 percent) of treatment school principals indicated that breakfast supervision had increased, compared to only 12 percent of control schools (Exhibit 3.8). The increase in breakfast supervision stems from a combination of increased breakfast participation and a shift of breakfast from the cafeteria to the classroom in some treatment schools.

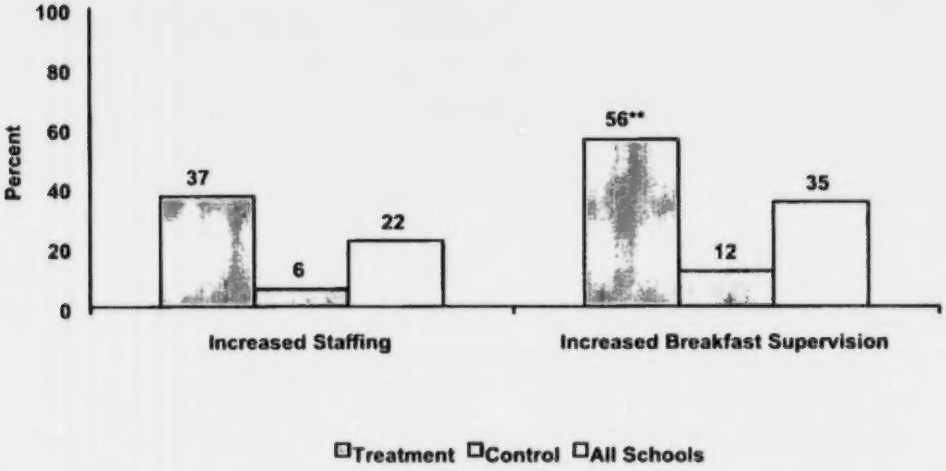
While 60 percent of the treatment school principals indicated that there had been an increase in reporting as a result of implementing the universal-free school breakfast program (Exhibit A-30), only 42 percent indicated that there was an increase in the workload of their office staff (Exhibit A-29). Since virtually all additional reporting requirements resulting from universal-free school breakfast were associated with gathering data for the evaluation, it is not clear whether the changes identified by respondents were due to the program itself or to the evaluation or both. This issue will be examined in more detail in the follow-up survey that will be conducted late in SY 2002-2003.

Clearly the schools where breakfast was shifted from the cafeteria to the classroom had to make major changes in their operations to accommodate this change. As part of the on-site visits, interviews were conducted with 16 teachers whose classes ate breakfast in the classroom. Although based on a small sample, the experience of these teachers is indicative of the changes that might accompany shifting breakfast from the cafeteria to the classroom.

School breakfast preceded the start of the school day by about 30 minutes in 10 of the 16 classrooms (Exhibit A-64). In the remaining six classes, school breakfast was treated as part of the school day with only about 15-18 minutes allotted for breakfast. Regardless of whether breakfast took place before or during the regular school day, all 16 teachers indicated that "breakfast time" was used for more than eating breakfast. Eating breakfast in the classroom appears to have little effect on classroom preparation time and/or instruction time. A majority of the teachers interviewed (11 of 16) indicated that having breakfast in the classroom had little or no effect on the amount of time available

Exhibit 3.8

Share of School Principals Reporting Changes in School Operations in SY 2000-2001 Due to the SBPP



N=152

**Difference between treatment and control schools is statistically significant at the .01 level.

Source: *Implementation Study – School Principal Interview, Spring 2001*

for classroom preparation or instruction (Exhibit A-66). Of the five remaining teachers, one indicated that there had been a major reduction in classroom preparation time and/or instruction time.[11] The remaining four teachers described the impact as minor.

Although nearly all (14 of 16) of these teachers indicated that spillage was a minor problem, there were relatively few other problems that teachers encountered when breakfast was eaten in the classroom (Exhibit A-68). Other problems identified included trash removal (4 of 16), less class time (2 of 16), and additional record-keeping (1 of 16).

Foodservice Operations

This section examines the impact of universal-free school breakfast on the foodservice operations of the schools providing these meals. While the availability of free breakfasts at school appears to have had relatively little impact on instructional programs, it was anticipated that many changes in foodservice operations might occur in response to implementing the program. The impact of universal-free school breakfast on various aspects of foodservice operations is shown in Exhibit 3.9 and included:

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[11] Breakfast in this school was served prior to the school day.

Exhibit 3.9

Effects of Universal-Free School Breakfast on Selected Aspects of Foodservice Operations

Characteristic	Treatment Schools	Control Schools	All Schools
	Percent of Schools Reporting a Change		
Increase in cafeteria staff workload	60**	15	38
Increase in breakfast supervision	56**	12	35
Preparation practices	30	10	20
Change in menu composition	28*	11	20
Perceived increase in plate waste	18	1	10
Median length of time for breakfast service	30 minutes	30 minutes	30 minutes
Moderate or significant student initiative needed to access school breakfasts	22	30	26
Increase in reporting requirements	19**	3	11
Number of Schools	79	74	153

* Difference between treatment and control schools is statistically significant at the .05 level.

** Difference between treatment and control schools is statistically significant at the .01 level.

Sources: Implementation Study – School Principal Interview and Cafeteria Manager Interview, Spring 2001

- **Cafeteria staff workload.** Given the large increase in the number of students eating breakfast, it is not surprising that 60 percent of treatment school cafeteria managers reported an increase in the workload of cafeteria workers (23 percent also reported hiring additional staff; Exhibit A-54). By contrast, only 15 percent of control school cafeteria managers reported an increased workload for their staff.

- **Breakfast supervision.** The increased number of students eating breakfast in treatment schools resulted in an increased need for staff supervision. As noted above, principals in 56 percent of the treatment schools reported an increase in breakfast supervision, compared to only 12 percent in control schools. This increase among control schools could be partially due to higher enrollments.

- **Preparation practices.** Most control schools experienced few operational changes in SY 2000-2001, the first year of the pilot. About 12 percent of the cafeteria managers in these schools indicated that breakfast preparation took more time. By contrast, nearly one out of three treatment school cafeteria managers (30 percent) indicated that preparation staffing and/or practices in their school had changed. Among the treatment schools, preparation practices changed more often in the schools where breakfast was served in the classroom (12 of the 18; Exhibit A-54). Treatment schools indicated that their cafeterias had incurred additional expenditures as a result of implementing universal-free school breakfast. The expenditures were for such things as carts and coolers used to transport food to the classroom, carpet cleaners, trash containers, and additional trash pick-up.[12]

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[12] As discussed later in this chapter, the increased revenues from the additional meal reimbursements more than offset these additional costs.

- **Menu composition.** Cafeteria managers were asked if the composition of the breakfasts they served had changed in any way in SY 2000-2001. Although only 1 in 5 schools reported a change, a significantly higher share of the cafeteria managers in treatment schools than in control schools said they had made menu changes (28 percent versus 11 percent; Exhibit 3.10). Among the reasons cited for making these changes were: substituting new items (23 percent), offering more prepackaged foods (18 percent), and replacing cereal and toast with other foods (18 percent).

- **Plate waste.** Cafeteria managers were asked if they detected any difference in the relative magnitude of plate waste from the previous year. A majority of those responding, whether from control or treatment schools, responded that they detected no change (Exhibit A-58). However, a larger share of cafeteria managers from treatment schools said that their schools had experienced an increase in plate waste (18 percent versus 1 percent). At the same time, about half this number of treatment schools (9 percent) reported that plate waste in their schools had fallen over the period, while 4 percent of control school cafeteria managers reported a decrease in plate waste.

  Given the relatively large increase in school breakfast participation that occurred in most treatment schools in SY 2000-2001, some increase in the absolute volume of plate waste would be expected. Although respondents were asked for their opinion of changes in the "relative magnitude" of plate waste, it seems likely that at least some of the responses were based on perceptions of the change in absolute volume.

- **Length of breakfast service.**[13] The median length of time allotted for breakfast service, both in control and treatment schools, was 30 minutes in SY 2000-2001 (Exhibit 3.9). However, there was a wide variation around the median, among schools within districts as well as between districts. At one end of the continuum, 18 percent of all schools reported allowing no more than 20 minutes, while at the other end 30 percent of the schools allow at least 40 minutes (Exhibit A-50).

  The median time allotted for breakfast in schools serving breakfast in the classroom is the same as the median for all schools, 30 minutes. However, more than one third of these schools allow no more than 20 minutes.

- **Ease of access.** More than two thirds (69 percent) of all responding cafeteria managers said that it took "little" or "no" initiative by the students in their schools to eat school breakfasts. Predictably, the ease of access to breakfasts was considered greatest by the cafeteria managers in schools serving breakfast in the classroom. Among this group, 80 percent said that no initiative was required. One district stood out from the others in that nearly 60 percent of their cafeteria managers felt that it took moderate, if not significant initiative on the part of students to eat school breakfast.

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[13] The "length of breakfast service" is the period of time for which breakfast service is available, not necessarily the length of time taken to eat breakfast.

Exhibit 3.10

Share of Schools Reporting Change in the Composition of School Breakfasts During SY 2000-2001 and Nature of the Change

	Change in Breakfast Composition		Nature of Change					
School Type	N	Percent	N	More Pre-packaged Items	More/ New Items Offered	Fewer Items Offered	Not as Many Hot Items	Variety of Items Replaced Cereal and Toast
			Percent of Those Schools Reporting Change in Composition					
Treatment	79	28**	22	18	22	14	14	18
Control	74	11	8	0	13	35	13	0
All	153	20	20	13	20	16	13	10

**Difference between treatment and control schools is statistically significant at the .01 level.

Source: *Implementation Study – Cafeteria Manager Interview, Spring 2001*

Role of Custodians

During the on-site data collection, custodians in 15 schools were interviewed to determine the role that they played in breakfast service and to assess any changes that occurred in SY 2000-2001. In most schools that serve breakfast in the cafeteria, custodians perform three functions: setting up and putting down the tables, removing trash, and cleaning floors. There was one exception to this among the six districts in the study. In this district, cafeteria staff are responsible for most custodial tasks associated with the school foodservice operation.

In 2 of the 15 schools in which these interviews were conducted (both in the same school district), custodians participated in the supervision of students during breakfast service (Exhibit A-76). Across all schools taking part in the SBPP, 17 percent of the cafeteria managers said that custodians assisted in breakfast supervision in their schools.

The approximate time spent on breakfast-related tasks by these custodians ranged from less than one quarter-hour (four schools) to two hours or more (four schools) (Exhibit A-78). Two of the 10 custodians working in treatment schools said that the average time required for breakfast service increased in SY 2000-2001, while one custodian reported a decline in time spent.

Of the 15 custodians interviewed, seven indicated that the nature or level of custodial involvement in breakfast service had changed in SY 2000-2001 (Exhibit A-77). Of the seven, six worked in treatment schools and one in a control school. For the three custodians working in treatment schools that served breakfast in the classroom, the principal changes were more trash collected from more locations offset by reduced use of the cafeteria. While two of these respondents said that this resulted in a net increase in their workload, the third custodian said there had been a net decrease. The three custodians working in treatment schools that served breakfast in the cafeteria were split over whether the changes they encountered in SY 2000-2001 increased, decreased, or had no effect on their workloads.

Role of Teachers Serving Breakfast in the Classroom

Of the teachers interviewed during the on-site data collection, 16 taught classes where breakfast was served in the classroom. To gain further insight into the role these teachers played in the breakfast service, they were asked about their involvement in three breakfast-related tasks: serving, clean-up, and record-keeping.

Of the three tasks, record-keeping was the only one that all 16 teachers took part in (Exhibit A-65). Seven of the 16 teachers described the role they played in record-keeping as "major" while the other nine teachers characterized it as "minor." Most of the teachers played no role in serving while 10 of the 16 said they played no role in clean-up either. Of the remaining six teachers, five said their role in clean-up was "minor" while one described it as "major".

On the basis of this small sample, it would appear that teachers play a largely indirect role in serving breakfasts in the classroom. Their involvement is largely limited to maintaining a daily record of which students in the class participate in the program.

Food and Nutrient Composition of School Breakfasts

This section presents findings on the effects of universal-free school breakfast on the food and nutrient composition of school breakfasts served to students. To provide a context for interpreting the results, it includes a review of the nutrition standards for the SBP and other relevant benchmarks. This is followed by a brief description of the measures and data sources, and a summary of results.

As noted above, increased student participation and changes in the location of breakfast service in the treatment schools led to some reported changes in breakfast menus among schools offering the program. This was not surprising; for example, to serve more students food preparation might have to be simplified by offering fewer items or relying more on pre-prepared foods. And serving breakfasts in locations other than the cafeteria could curtail offering hot entrees or items likely to make clean-up more difficult. In turn, these changes could have implications for the types, variety, and number of food items offered; the nutritional quality of the meals; and compliance with established nutrition standards for the SBP. An understanding of the nature of these changes, if any, might also help in interpreting impacts of universal-free school breakfast on participation, dietary intake, and other student outcomes.

Nutrition Standards for School Breakfasts

USDA regulations require that SBP breakfasts offered to students meet defined nutrition standards to be eligible for federal subsidies. Schools may use either a food-based menu planning approach (meal pattern) or a nutrient analysis based menu planning approach (Nutrient Standard Menu Planning or Assisted Nutrient Standard Menu Planning) to satisfy these requirements. Alternatively, schools can develop their own menu planning approach within USDA's guidelines. Food-based menu planning systems require that breakfasts offered to students include a minimum number of servings of specific meal components (milk; fruit and/or vegetables; bread or grains; and/or meat or meat alternates) each day. Minimum required portion sizes are also specified for children in different grades. Nutrient-based menu planning approaches require use of a computerized nutrient analysis system and specify a minimum number of menu items that must be offered. Regardless of the system menu planners use to meet the specified nutrition standards, milk and at least two to three other food items must be offered. For food-based systems, at least four food items must be offered.

Since the School Meals Initiative for Healthy Children (SMI) was implemented in 1995, the regulations have stipulated that the nutrients in the breakfast, averaged over a school week, must provide approximately one fourth of the 1989 Recommended Dietary Allowances (RDA) for food energy (calories) and target nutrients for children in specific age/grade groups and that meals offered must be consistent with the 1990 *Dietary Guidelines for Americans.*[14] The SMI standards were used in the analyses presented here and are shown in Exhibit 3.11. A second set of reference standards, based on recommendations in the National Research Council's *Diet and Health* report, were used for dietary components that are routinely included in SMI menu planning and analysis software but not quantified in SMI nutrition standards. These include the percentage of food energy from carbohydrate as well as total cholesterol and sodium content.[15] *Note that schools are not required to meet these additional standards. They are used in this report to facilitate interpretation of the data.*

Exhibit 3.11

Nutrition Standards for Evaluating School Breakfast Menus in the SBPP

Nutrient	Standard
SMI Nutrition Standards Defined in Program Regulations	
Nutrients with established Recommended Dietary Allowances (RDAs)[1]	
Food energy, protein, vitamin A, vitamin C, calcium, and iron	One fourth of the RDA
Nutrients included in the *Dietary Guidelines for Americans*[2]	
Total fat	≤ 30% of total calories
Saturated fat	< 10% of total calories
National Research Council *Diet and Health* Recommendations[3]	
Carbohydrate	> 55% of total calories
Cholesterol	≤ 75 mg
Sodium	≤ 600 mg

[1] National Research Council (1989a). *Recommended Dietary Allowances*, 10th edition. Washington, DC: National Academy Press.

[2] U.S. Departments of Health and Human Services and Agriculture (1990). *Nutrition and Your Health: Dietary Guidelines for Americans*, 3rd edition. Washington, DC: U.S. Government Printing Office.

[3] National Research Council (1989b). *Diet and Health: Implications for Reducing Chronic Disease Risk.* Washington, DC: National Academy Press. Standards used for cholesterol and sodium are one fourth of recommendations for maximum daily intake.

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[14] Federal Register 60:113, 31188-31222, June 13, 1995.

[15] Information on dietary fiber is also provided in menu planning and analysis systems; however, neither the *Dietary Guidelines* nor the National Research Council's *Diet and Health* report provides a quantitative recommendation for dietary fiber intake. The American Health Foundation has recommended a minimum daily fiber intake for children older than age two based on the child's age plus five grams (Williams, 1995). Although not typically applied to school meals, this guideline may provide a context by which to interpret findings on the fiber content of breakfast menus. If one fourth of the "age plus five" grams per day recommendation were used as a benchmark, the recommended range for elementary school breakfasts would be approximately 2.5 to 4.5 grams.

Measures and Data Sources

Four measures of the food and nutrient composition of the schools' breakfast menus were used to evaluate the effects of universal-free school breakfast on breakfasts served. They include:

- Number of foods offered;
- Types of foods and beverages offered;
- Average food energy and nutrient content of breakfasts served; and
- Percent of schools whose average breakfast met SBP nutrition standards and National Research Council (NRC) recommendations.

Data used to develop these measures were obtained from the Breakfast Menu Survey, a self-administered instrument completed by the cafeteria manager in each school. Information was collected about all of the foods and beverages served as part of the USDA reimbursable breakfasts for a specified five-day period that coincided with the Impact Study data collection (the "target week").[16] For each menu day, the survey collected: a description of each food and beverage offered; the method of preparation, a recipe (if applicable), or the Nutrition Facts and ingredient list from the packaging of pre-prepared foods; portion sizes; the number of students served each item; and the total number of reimbursable meals served.

To obtain food and nutrient summaries for analysis, the menu data for each school were entered into the Nutrition Data System for Research (NDS-R).[17] (The same nutrient analysis system was used to collect and analyze students' dietary intake data.) Menu items were categorized into food groups generally consistent with the food-based meal patterns to facilitate food-based analyses. A weighted nutrient analysis was conducted for each school's breakfast menus to determine the average nutrient content of breakfasts served.[18]

All measures were tabulated separately for control and treatment schools, overall and for each district (see Appendix A, Exhibits A-84 through A-111). Unless otherwise noted, comparisons between control and treatment schools were tested for statistical significance using two-tailed *t*-tests or chi-squares, as appropriate.[19] The criteria for statistical significance vary as a result of the unit of analysis chosen for each measure (i.e., the weekly average breakfast for each school versus daily breakfast menus). In addition, the Appendix exhibits noted above present treatment school results separately for schools where breakfast was eaten in the classroom and schools where breakfast was eaten in the cafeteria or other location (non-classroom). *The reader is reminded that the choice of where to serve breakfast was left up to the schools. Schools were not randomly assigned to classroom versus non-classroom feeding.* As a result, not only is the total number of schools serving breakfast in the classroom small, but any differences relative to non-classroom schools may reflect pre-existing differences between the schools. In addition, the small sample size limits the utility of significance testing (i.e., statistical power is quite low). These caveats should be considered when interpreting results of comparisons based on the location of breakfast service.

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[16] Breakfast menu surveys were retrieved from cafeteria managers in all schools participating in the SBPP. Ninety-one percent of surveys were completed for all five days. Because of holidays or teacher conferences, some surveys included only three or four days (N=13).

[17] NDS-R software version 4.03, developed by the Nutrition Coordinating Center (NCC) at the University of Minnesota, Minneapolis, MN (Food and Nutrient Database 31, released 2001).

[18] A weighted nutrient analysis is based on the number and types of foods actually served to students, giving greater weight to the nutrient value of foods that are served or selected more frequently. Results of a weighted analysis provide an estimate of the nutrients in an average breakfast served to/selected by students. In contrast, an unweighted nutrient analysis does not take into account students' selection patterns but provides information on the nutrient content of the average breakfast offered to students.

[19] Differences within the individual school districts were not tested for statistical significance, because the numbers of menus were often too small for results to be considered reliable.

Number of Foods Offered in School Breakfasts

To assess the effects of universal-free school breakfast on the degree of choice and variety among breakfast food items, the percent of daily menus that offered various numbers of foods and the mean number of options offered per day and per week were examined for each of six food groups.[20]

There was little difference between treatment and control school breakfasts that afforded students the opportunity to select between several types of food or beverage items. The largest variation overall was seen for milk. Although not tested for statistical significance, fewer breakfasts in treatment schools included more than one type of milk (e.g., whole, lowfat, flavored) relative to control schools (56 percent versus 66 percent). This finding may be attributable to classroom feeding where there are likely to be limitations on transporting and storing more than one type of milk. But given the lack of statistical power and non-experimental nature of the comparison, this cannot be concluded with confidence.

As shown in Exhibit 3.12, universal-free school breakfast was not associated with changes in the variety of foods offered. There were no significant differences in the mean numbers of different foods offered in daily breakfast menus or over the course of a week.

The only *potential evidence* of an effect of universal-free school breakfast on the number of different food items offered comes from comparisons within treatment schools by location of breakfast service (Exhibit A-84). Treatment schools that served breakfast in the classroom offered about one half-serving fewer grains/breads per day compared with non-classroom treatment schools ($p<.01$). This difference is relatively small, and as discussed earlier, can only be considered to be suggestive of an effect of universal-free school breakfast; it may instead reflect pre-existing differences between the schools.

Types of Foods and Beverages Offered in School Breakfasts

To examine effects on the types of foods and beverages offered, breakfast menu items were classified into 39 subgroups based on the most commonly offered items in each main food group. Exhibit 3.13 summarizes results of the analysis for the six main food groups. Findings for each of the subgroups, overall and by district, are shown in Exhibits A-91 through A-97.

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[20] Note that under food-based menu planning students are expected to select at least two grain or bread items (e.g., cereal and toast) or one meat plus one grain (e.g., egg and toast) or two meats (e.g., egg and sausage) to satisfy requirements for a reimbursable meal.

Exhibit 3.12

Variety in Foods Offered at Breakfast by Food Group

	Treatment Schools	Control Schools
Milk		
Mean items per day	2.0	2.1
Mean number of different items per week	2.1	2.2
Fruits/Juices/Vegetables		
Mean items per day	1.4	1.4
Mean number of different items per week	2.6	2.7
Separate Meats/Meat Alternates[1]		
Mean items per day	0.3	0.3
Mean number of different items per week	1.1	1.2
Separate Grains/Breads[1,2]		
Mean items per day	1.9	2.1
Mean number of different items per week	4.3	4.4
Combination Entrees		
Mean items per day	0.2	0.2
Mean number of different items per week	0.6	0.5
Number of Daily Menus[3]	377	358

[1] Not included in combination entrees.
[2] All varieties of cold cereals counted as one item.
[3] Includes breakfast menus collected during respective target weeks from 73 control schools and 78 treatment schools.

Source: *Implementation Study – Breakfast Menu Survey, Spring 2001*

Exhibit 3.13

Share of Breakfast Menus Containing Foods Commonly Offered

	Treatment Schools	Control Schools
	Percent of Breakfast Menus	
Milk	100	100
Fruits/Juices/Vegetables	100	100
Meats/Meat Alternates[1]	29	30
Grains/Breads[1]	97*	100
Combination Entrees	15	15
Other Menu Items[2]	2	4
Number of Daily Menus[3]	377	358

[1] Not included in combination entrees.
[2] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems (e.g., bacon, fruit drinks, margarine).
[3] Includes breakfast menus collected during respective target weeks from 73 control schools and 78 treatment schools.

* Difference between treatment and control schools is statistically significant at the .05 level.

Source: *Implementation Study – Breakfast Menu Survey, Spring 2001*

Except for breads and grains, breakfasts in treatment schools were as likely to include foods from all of the food groups as breakfasts offered by control schools. Treatment schools offered significantly fewer grain/bread items overall than did control schools (97 versus 100 percent of breakfasts, respectively) but this difference was not large enough to be of importance to the implementation of the SBP (Exhibit 3.13).[21] Differences for two subgroups of grains in particular were also statistically significant and larger in magnitude:

- Hot cereal and grits appeared significantly less frequently in breakfasts offered in treatment schools compared with control schools ($p<.01$). The difference was about 11 percentage points (Exhibit A-91).
- Crackers, specifically grahams and the sandwich-type with cheese or peanut butter, were included in significantly ($p<.05$) more daily breakfast menus in treatment schools compared to their controls. This difference was about 8 percentage points.

A possible explanation for the reduction in hot cereals and grits is the switch to serving breakfast in the classroom. None of the treatment schools that served breakfast in the classroom schools offered hot cereal or grits. Eggs and bacon were also notably absent from breakfast menus of classroom schools. There may be quality and safety issues associated with serving hot foods some distance from the cafeteria that result in these schools removing hot items from their menus. It is also possible that hot cereal and grits were not offered in classroom schools for reasons unrelated to universal-free school breakfast.[22] While crackers may have been selected for classroom breakfasts because they require no preparation or heating, they were also popular in the menus of non-classroom schools.

Food Energy and Nutrient Content of School Breakfasts Served

This section summarizes results of analyses of the effects of universal-free school breakfast on the nutrient content of school breakfasts served to (or selected by) students. Findings are presented in the context of the reference standards for amounts of food energy, nutrients, and other dietary components shown in Exhibit 3.11.

Mean Percent of RDA for Food Energy and Key Nutrients. Exhibit 3.14 shows the mean proportion of the RDA for food energy and target nutrients in breakfasts served for treatment and control schools. There were no significant differences associated with the implementation of universal-free school breakfast for food energy or any of the nutrients examined. Treatment school breakfasts contained similar amounts of these dietary components and were, on average, as likely to meet the SBP standard as control schools. Among treatment schools, results were similar regardless of the location of breakfast service (Exhibit A-98).

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[21] Although the difference between 97 percent and 100 percent of breakfast menus that contain grains/breads is statistically significant, it is not large enough to be of importance to the implementation of the SBP.

[22] Another finding *suggestive* of effects of classroom breakfast included significantly fewer breakfasts that included bread, bagels, and English muffins. These particular grain items may have been offered less commonly because they are often served toasted and with additions such as margarine, jelly, cream cheese or peanut butter. These items may present challenges in terms of acceptability and clean-up outside the cafeteria setting.

Exhibit 3.14

Mean Nutrient Profile of Breakfasts Served by School Type

Dietary Component	Standard/ Recommendation	Treatment Schools	Control Schools
As Percent of 1989 RDA:			
Food Energy	25%	21.9	22.8
Protein	25%	49.6	51.7
Vitamin A	25%	52.8	53.7
Vitamin C	25%	71.3	72.4
Calcium	25%	44.8	45.6
Iron	25%	47.0	49.7
Percent of Food Energy from:			
Total fat	≤ 30%	24.3	24.5
Saturated fat	< 10%	8.2	8.2
Carbohydrate	> 55%[1]	64.3	64.2
Mean Amount			
Cholesterol (mg)	≤ 75[1]	27.2*	33.0
Sodium (mg)	≤ 600[1]	534.9	583.3
Dietary fiber (gm)	–[2]	2.4	2.7
Number of Schools		78	73

RDA = Recommended Dietary Allowance.

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.
[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

* Difference between treatment and control schools is statistically significant at the .05 level.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

It should be noted that (across both treatment and control schools), breakfasts tended to be relatively nutrient-dense. For example, SBP breakfasts were particularly rich in vitamin C, providing 72 percent of the RDA on average. With the exception of food energy, the average breakfast in SBP schools exceeded the one-fourth RDA standard for all other key nutrients. Note that the food energy content of breakfasts in control schools in the SBPP is consistent with findings from the School Nutrition Dietary Assessment Study-II, where elementary school breakfasts provided 23 percent of the RDA for food energy (Fox, et al., 2001).[23]

Percent of Food Energy from Total Fat and Saturated Fat. There were no differences overall in the percent of food energy from total fat or saturated fat in the average breakfast served in treatment and control schools (Exhibit 3.14). On average, breakfasts in both treatment and control schools met the SBP standards for no more than 30 percent of food energy from total fat and less than 10 percent from saturated fat.

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[23] Although SBP regulations require that schools offer at least one fourth of children's RDA for food energy at breakfast, the average energy intake at breakfast among elementary school students is closer to 20 percent of RDA (USDA/ARS, 1999). On average, SBPP schools were serving breakfasts with this level of food energy.

Within treatment schools, breakfasts served in the classroom were significantly higher in total fat as a percent of food energy ($p<.05$) than non-classroom breakfasts (Exhibit A-98).[24] However, as discussed previously, this may or may not represent an effect of universal-free school breakfast. Furthermore, the mean percent of food energy from total fat was well within the SBP standard maximum regardless of location of breakfast service.

Cholesterol, Sodium, Carbohydrate, and Dietary Fiber. The implementation of universal-free school breakfast had no effect on mean levels of sodium, the percent of food energy from carbohydrate, or dietary fiber (Exhibit 3.14). The cholesterol content of breakfasts served by treatment schools was significantly lower than that of control schools. The difference, however, was not large (6 milligrams (mg)), and breakfasts served in both groups of schools met the NRC-based recommendation of no more than 75 mg by a substantial margin.

There do not appear to be any differences in the cholesterol, sodium, or carbohydrate content of breakfasts in universal-free schools serving breakfast in the classroom versus the cafeteria. Breakfast location may have played a role in the amount of dietary fiber provided. Breakfasts served in the classroom contained somewhat less fiber than non-classroom breakfasts, 2.0 grams compared with 2.5 grams, respectively ($p<.05$; Exhibit A-98).

Percent of Schools That Met SBP Nutrition Standards and NRC Recommendations

The proportions of treatment and control schools whose average breakfast meets the reference nutrition standards are shown in Exhibit 3.15. Results show that the implementation of universal-free school breakfast did not significantly affect schools' compliance with the SBP nutrition standards or the degree to which their breakfasts met NRC-based dietary recommendations. There were no significant differences in the proportions of schools whose average breakfasts satisfied the one-fourth RDA standard for food energy and targeted nutrients. In addition, no significant differences were noted in the proportions whose breakfasts met the SBP standards for total fat and saturated fat or the NRC-based recommendations for carbohydrate, cholesterol, and sodium.

More than nine out of 10 of control and treatment schools served breakfasts that met the SBP standard for vitamins A and C, calcium and iron, and all schools met the protein standard. While only half as many treatment (9 percent) as control schools (18 percent) were able to satisfy the RDA standard for food energy, this difference is not statistically significant ($p=.11$).

There may be some small differences in the percentage of treatment schools' breakfasts that met the RDA-based standards by location of breakfast service (Exhibit A-105). Fewer treatment schools that served breakfast in the classroom met the one-fourth RDA standard for vitamin A (83 versus 98 percent) and vitamin C (83 versus 97 percent) than schools not serving breakfasts in the classroom ($p<.05$). The differences are 15 and 13 percentage points, respectively.

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[24] The mean amounts of total fat in classroom and non-classroom breakfasts were 13.2 grams and 11.4 grams, respectively ($p<.05$).

Exhibit 3.15

Proportion of Schools in Which the Average Breakfast Met SBP Nutrition Standards and NRC Recommendations

Dietary Component	Standard/ Recommendation	Treatment Schools	Control Schools
		Percent of Schools	
Food Energy	25% of 1989 RDA	9	18
Protein	25% of 1989 RDA	100	100
Vitamin A	25% of 1989 RDA	95	96
Vitamin C	25% of 1989 RDA	94	96
Calcium	25% of 1989 RDA	97	99
Iron	25% of 1989 RDA	91	95
Total fat	≤ 30% of food energy	92	88
Saturated fat	≤ 10% of food energy	83	86
Carbohydrate	>55% of food energy[1]	94	92
Cholesterol	≤ 75 mg[1]	99	100
Sodium	≤ 600 mg[1]	83	75
Number of Schools		78	73

RDA = Recommended Dietary Allowance.

[1] National Research Council (NRC) recommendation, not SBP standard.

Note: None of these differences are statistically significant.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

School District Costs and Revenues

Costs

During the on-site visits in April 2001, information on food and labor costs was collected from each of the SFA directors.[25] The food and labor costs of a reimbursable breakfast were calculated using information collected for the target week according to the following procedure:

- **Average cost of food in a reimbursable breakfast.** Food cost information was collected on a per-serving basis.[26] These data were then used in conjunction with the weighted menu analysis described above to obtain the average cost of food in a reimbursable breakfast.

- **Average cost of production labor in a reimbursable breakfast.** Breakfast labor costs for each individual foodservice worker were obtained for the target week. This included the hours per day typically devoted to breakfast service, their hourly wage rate, and any fringe benefits, converted to an hourly basis. Labor costs per reimbursable breakfast were calculated by dividing the total breakfast labor cost in each school for the week by the number of reimbursable breakfasts served during the target week.

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[25] Food and labor were found to account for 89 percent of the reported costs of a reimbursable breakfast in an earlier cost study (Glantz et al., 1994b).

[26] In cases when the SFA director could not provide food costs on a per meal basis, they were converted to a per-meal basis using a combination of standard conversion factors and serving size information provided by the cafeteria manager in each school.

Exhibit 3.16 presents a comparison of the average food and labor costs per meal between treatment and control schools. During the target week, the average food and labor cost of a reimbursable breakfast was significantly lower in the treatment schools ($0.80) than in the control schools ($0.90). This difference is entirely due to the difference in average labor costs ($0.25 versus $0.35). There were no significant differences in the average food costs.

Exhibit 3.16

Comparison of Average Food and Labor Cost Per Reimbursable Breakfast for SBPP Treatment and Control Schools, One Week Period in SY 2000-2001

School Type	Number Of Schools	Average Number Of Meals/Day	Average Food Cost Per Meal	Average Labor Cost Per Meal	Average Food and Labor Cost Per Meal
Treatment	79	191**[a]	$0.55	$0.25**[a]	$0.80**[a]
Classroom	18	395	0.56	0.18	0.74
Non-classroom	61	130**[b]	0.55	0.27*[b]	0.82*[b]
Control	71	110	0.56	0.35	0.90

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

[a] Comparison is between treatment and control schools.

[b] Comparison is between classroom and non-classroom treatment schools.

Sources: Implementation Study – Breakfast Menu Survey, Spring 2001, and district records

This is not surprising given the significantly higher breakfast participation rates in the treatment schools (discussed above) and the economies of scale that are possible in the breakfast program (Glantz et al., 1994b).[27] The higher participation rates in the treatment schools translated into a substantially higher volume of breakfasts being served in the treatment schools. During the target week, the average number of breakfasts served in treatment schools exceeded the average for control schools by 74 percent (191 versus 110).[28] For treatment schools serving breakfast in the classroom, the contrast was even greater. While treatment schools serving in the classroom averaged nearly 400 breakfasts per day, those serving breakfast in the cafeteria averaged 130 breakfasts per day. Because there is a minimum level of labor required for preparing and serving breakfasts, and because labor is added in discrete units, the labor cost per reimbursable breakfast declines as the number of breakfasts served increases.

With increased participation and more meals served, many treatment schools added to their cafeteria workforce in SY 2000-2001. Some hired additional staff while many extended the hours of existing staff. However, the increased number of breakfasts served more than offset the increased cost of labor, reducing the average per-meal labor cost. The still higher volume experienced by treatment schools serving breakfast in the classroom brought the average labor cost per meal for these schools even lower, to $0.18 per breakfast.

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[27] Economies of scale are made possible when the cost of fixed inputs (cafeteria staff) can be spread across increased output (reimbursable breakfasts), thereby reducing per-unit cost.

[28] The comparable margin for all of SY 2000-2001 was 68 percent.

It is noted that at least a portion of the more efficient use of cafeteria staff that is achieved when breakfasts are served in the classroom results from the increased involvement of students, teachers, and custodians. Since only labor provided by cafeteria staff is included in these cost estimates, the measured difference in per meal cost overestimates the overall saving in labor.

Revenues

School districts are reimbursed for each breakfast they serve that meet program requirements. As noted earlier, the amount of the reimbursement is dependent on whether the child receiving the breakfast qualifies for a free or reduced-price meal and on whether the school serving it qualifies as a severe-need school. The rates of reimbursement per breakfast in SY 1999-2000 and SY 2000-2001 are shown in Exhibit 3.17.

Exhibit 3.17

Rate of Reimbursement for School Breakfast by Meal Type and Severe-Need Status

	SY 1999-2000		SY 2000-2001	
Type Of Reimbursement	**Severe-Need School**	**Not Severe-Need School**	**Severe-Need School**	**Not Severe-Need School**
Paid	$0.21	$0.21	$0.21	$0.21
Reduced-price	1.00	0.79	1.03	0.82
Free	1.30	1.09	1.33	1.12

Source: Federal Register, July 9, 1999, p. 37091 and June 27, 2000, p. 39593

Exhibit 3.18 compares average reimbursements and average food and labor costs for school breakfast in SY 2000-2001. While control schools were reimbursed for breakfasts in accordance with this schedule in SY 2000-2001, treatment schools were reimbursed at the "free" meal rate for all breakfasts. Treatment schools therefore benefited from a combination of: (1) being able to apply the highest reimbursement rate to all the breakfasts they served and (2) increased participation. As a result, in SY 2000-2001, the average value of reimbursements going to treatment schools was notably higher than that of the control group ($39,894 versus $19,312). However, average total food and labor costs for the treatment group were also significantly higher as a result of the substantially higher volume of breakfasts served ($24,142 versus $16,339). Thus, while reimbursements exceeded food and labor costs in both treatment and control schools, the difference was much greater in the treatment schools ($15,752 versus $6,418). Another way to examine costs is to see whether revenues cover breakfast food and labor costs. This was the case in 95 percent of the treatment schools and only 80 percent of the control schools.

These findings should be interpreted with care. Although, as noted above, food and labor are by far the largest cost components of a school breakfast, there are other costs that are not reflected in this analysis. This includes the cost of other labor (e.g., administrative staff and custodians), utilities, equipment depreciation, trash removal, and supplies. Including these other costs (which were not collected in this study) might reduce (or eliminate) the average surpluses reported above and might increase the percent of schools where food and labor cost exceed total revenue.

Exhibit 3.18

Comparison of Average Per School Federal Reimbursements and Estimated Food and Labor Costs for School Breakfast, SY 2000-2001

Item	Treatment Schools	Control Schools
Estimated reimbursements	$39,894	$19,312
Estimated revenue from paid meals	na	3,445
Total breakfast revenue	39,894	22,757
Estimated food and labor cost	24,142	16,339
Difference	15,752	6,418
Percent of schools where total breakfast revenue equaled or exceeded food and labor cost[1]	94.9%	80.3%

N=150

na = not applicable

[1] If food and labor costs are inflated by 12.4 percent to account for "all other" costs, consistent with the findings of earlier research (Glantz et al., 1994b), the share of schools where total breakfast revenue equaled or exceeded total cost falls to 92.4 percent for treatment schools and to 57.7 percent for control schools.

Sources: Implementation Study – Breakfast Menu Survey, Spring 2001, Impact Study – School-Level Data, SY 2000-2001, and district records

School Climate

It has been hypothesized that questions concerning school climate may proxy for underlying issues within a school such as the stigma associated with programs being utilized by low-income populations. It has been suggested that universal-school breakfast may alleviate issues such as these by "the detachment of free breakfast from any income requirements" (Ponza, 1999). It has also been suggested that students who attend school having eaten breakfast may contribute to a more positive school environment. Previous research found that school breakfast programs were associated with improved school climate (Peterson et al., 2001; Murphy and Pagano, 2001).

The School Climate Survey used for this study, developed by Dr. Kyla Wahlstrom at the University of Minnesota, consists of 25 questions on aspects of school climate such as teacher satisfaction, order and discipline, student attitudes towards academics, and sense of school community. The survey took about five minutes to complete. Teachers were asked to rate the various aspects of school climate on a four-point scale, where, for analysis, 1 = the least positive response and 4 = the most positive response.

From the 25 items on the survey, constructs for analysis were created. Items were first sorted based on face validity, and then two constructs, "school atmosphere" and "student behavior," were created. Using Cronbach's alpha[29], these constructs were examined for internal consistency. It was found that nine items revealed low correlation with the construct and these were removed. Based on this process, the items were ultimately separated into two constructs as follows:

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[29] Cronbach's or coefficient alpha is a measure of the reliability of a scale or composite score created from a set of individual items. It measures reliability in terms of internal consistency, i.e., the extent to which items in the scale are correlated with one another. A value of .80 or higher is considered to be a measure of high reliability for social science research.

- School atmosphere (7 items); and
- Student behavior (9 items).

These constructs showed acceptable levels of internal consistency (α=.864 for school atmosphere and α=.885 for student behavior).

No significant differences were found between treatment and control schools on these two subscales (Exhibits A-74 and A-75). The mean score on the School Atmosphere subscale was 3.31 for treatment schools and 3.33 for control schools; in both treatment and control schools, teachers had a very positive perception of the school atmosphere. Similarly, the overall mean score on the Student Behavior subscale was 2.76 for treatment schools and 2.78 for control schools, a mostly positive rating.

Stakeholder Perceptions and Attitudes

Several groups have a stake in the outcome of the SBPP. Leading the list are the students and their parents. If the program is not accepted by the students that it is designed to benefit or their parents, then participation will remain low. Needless to say, the school foodservice community also has a major stake in the outcome. From the SFA directors who administer these programs through the cafeteria workers and custodians in the schools, all are directly involved in the implementation of universal-free school breakfast and are affected by how it is implemented and by its success.

For school administrators, particularly school principals, universal-free school breakfast raises new issues regarding the integration of school feeding and classroom instruction. Beyond the operational issues associated with increased participation in school breakfast, there is the potential benefit of students who are more ready to learn, but also the potential that breakfast could detract from classroom time and focus. Teachers are affected by it as well. While the extent of teacher involvement was dependent on how universal-free school breakfast was implemented, few were unaffected by it.

Gauging the attitude of stakeholders toward the pilot offers useful insight into what is working and what isn't working and why. The attitudinal information described here was collected through a combination of stakeholder interviews and student focus groups. Findings are discussed by stakeholder group.

Administrators' Attitudes

School administrators, whether at the district level or the school level, generally had a positive attitude toward the SBPP. School district administrators expressed satisfaction (and some surprise) that universal-free school breakfast had operated so smoothly in its first year. To the extent district administrators expressed reservations about the program, they were due to: (a) the short lead-time they were given to get the program underway and (b) the demands of the evaluation.[30]

Principals were asked to describe the attitude of major stakeholders, including administrators, toward the breakfast program in their school in SY 2000-2001. Responses were recorded on a five-point scale ranging from extremely positive to extremely negative. A majority of the principals characterized the attitude of administrators as "positive" or "extremely positive," with similar findings for treatment schools (85 percent) (Exhibit A-34) and control schools (86 percent) (Exhibit A-36).

Foodservice Staff Attitudes

All six of the SFA directors voiced strong support for universal-free school breakfast. All had been instrumental in bringing the pilot to their districts and at the time of our interviews, remained committed to it. Four of the six characterize the SBPP as having had a "strong" impact on school breakfast participation in its initial year; the other two described the impact as "moderate." When asked about the overall attitude of the district's foodservice staff toward universal-free school breakfast, five of the six described it as "positive," with the remaining director describing staff attitude as having been "neutral" at the beginning of the year but becoming more "positive" as the program became established.

As reported by cafeteria managers, cafeteria staff have a positive attitude toward school breakfast, and 82 percent described staff attitude toward the program as "positive" or "very positive." There were no significant differences between treatment and control groups in the attitudes of cafeteria staff (Exhibit A-59).

Teachers' Attitudes

Virtually all of the 54 teachers interviewed during the on-site visits were supportive of the school meals programs and acknowledged the contribution they make to the educational mission of the school.[31] Ninety-five percent of the teachers believe that breakfast is important to preparing students to learn. Similarly, 89 percent believe that school meals contribute to learning. These views were widely held with no significant differences between treatment and control schools. This view was supported by school principals. About three quarters of the principals interviewed described the attitude of their teachers as "positive" or "extremely positive." Here too, there was little difference between treatment schools and control schools (Exhibits A-34 and A-36).

Teachers' attitudes towards eating breakfast in the classroom appear to be based on their experience (Exhibit A-67). Ten of the 16 teachers who taught in classrooms where breakfast was consumed had a positive opinion of the experience when interviewed. By contrast, 27 of the 38 teachers who had not taught in classrooms where breakfast was served were opposed to the idea (Exhibit A-69). If the attitude of the teachers in this admittedly small sample is representative of the universe, it is not difficult to see why so few schools have chosen to serve breakfast in the classroom. At the same time, it is suggestive of how attitudes might be changed through fuller understanding of the approach and its implications.[32]

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[30] Two district administrators said during their interviews that if they had the decision to make over again, given the demands of the evaluation, their district might not have chosen to participate (Exhibit A-6). When asked to identify steps that might have been taken to make the pilot function more smoothly, three of the six district administrators cited the need for a longer lead-time.

[31] The 54 teachers interviewed during the on-site visits were randomly selected in each of the 18 schools visited from among those teachers in the classrooms in the Impact Study sample and were therefore among the 854 teachers in the School Climate sample.

Custodians' Attitudes

As noted earlier, the increased volume of breakfasts served in treatment schools has added to the workload of custodians. Also, changes in procedure, such as serving breakfast in the classroom, have altered the nature of custodial tasks in some schools. However, according to more than 80 percent of principals, despite an increase in the workload of treatment school custodians, the vast majority of custodians have a view of school breakfast that extends from extremely positive to neutral, whether they work in control schools (Exhibit A-36) or treatment schools (Exhibit A-34).

Parents' Attitudes

Two thirds or more of the 3,423 parents interviewed reported positive attitudes toward school breakfasts. Treatment school parents were more positive than control school parents. Significantly more treatment than control school parents (Exhibit A-83) reported that they "strongly agreed" with the following statements:

- School breakfast is a well-balanced meal;
- Children like school breakfasts;
- School breakfasts are served at a convenient time;
- It is easy for children to participate in the SBP; and
- The SBP gives all children an opportunity to eat breakfast.

Few parents (less than 5 percent at the treatment and control sites) believed that school breakfasts should only be available to low-income children.

Students' Attitudes

A variety of techniques and information sources were used to determine student attitudes toward school breakfasts in general and toward the changes associated with universal-free school breakfast in particular. Principals and cafeteria managers were asked for their perceptions of changes in student attitudes toward school breakfast in SY 2000-2001. Information was collected from students in two ways. As part of the Impact Study on-site data collection, about 4,300 students were interviewed and asked about their attitudes and eating habits relating to breakfast. (Chapter Four provides a description of the methodology.) In addition, focus groups were conducted with students in grades four through six in 12 schools. The purpose of these sessions was to engage students in an open discussion of their likes and dislikes of school breakfast and to help reveal any evidence of stereotyping of students who eat school breakfasts.

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[32] This is generally consistent with the results of other universal-free school breakfast demonstrations (see Murphy, 2000b), although teacher attitudes toward the program have not been extensively documented.

Most school principals (85 percent control and 87 percent treatment) indicated that their students had a positive attitude toward school breakfast (Exhibits A-34 and A-36). There were no significant differences between the perceptions of treatment and control school principals regarding student attitudes towards the program. However, the perception of cafeteria managers was quite different. When asked about changes in student attitude toward school breakfast between the base year (SY 1999-2000) and the initial year of the pilot (SY 2000-2001), nearly three times as many cafeteria managers in treatment schools as in control schools (60 percent versus 22 percent) believed that student attitudes had become more positive over this period (Exhibit A-60).

In interviews with nearly 4,300 students, 50 percent of treatment group students reported eating school breakfasts more frequently in SY 2000-2001 than in SY 1999-2000, compared to only 26 percent of control students (Exhibit A-80).

Students in the focus groups indicated that their attitudes toward eating breakfast at school were determined by a combination of:

- Whether they like the food;
- How they feel about the breakfast setting;
- If there is enough time once they reach school; and
- For those who must pay, having the money.

Students' overall reaction to school breakfasts and what they said they liked and disliked about them were consistent throughout the focus groups, whether in control schools or treatment schools.

When the concept of universal-free school breakfast was described, nearly all students in the focus groups said they thought it was a good idea. It appealed to many students' sense of fairness and equity and to their belief that it would enable some students from low-income households to have breakfasts that they would otherwise not get.

The possibility of eating breakfast in the classroom was greeted with enthusiasm in the focus groups, both by students who were eating in the cafeteria and by those already eating in the classroom. For those students already eating in the classroom, the more pleasant setting seemed to more than compensate for what they perceived as a more restrictive range of menu choices. Some of the students who now eat in the cafeteria, though they liked the idea of eating in the classroom, expressed reservations about eating in the presence of their teachers. They also noted the possibility of clean-up problems that could result from eating in the classroom.

Some observers of the SBP have hypothesized that many students might view the program as one designed primarily for low-income students and that this stigma contributes to the low rate of participation. To test this hypothesis, principals, teachers, and students were asked (directly or indirectly) for their perceptions. Principals of all 152 schools were asked if they had observed evidence of a stigma associated with participation in the SBP. Overall, 89 percent responded in the negative (Exhibit A-33). The 54 teachers interviewed on-site were asked the same question with a similar outcome: 91 percent observed no evidence of the program being stigmatized (Exhibit A-70). And despite extensive probing in the student focus groups, there was little reported evidence of a stigma associating school breakfast with students from low-income households.

Part II

Impact Study

Chapter Four

Impact Study Design and Methodology

This chapter focuses on the design and methodology used to conduct the Impact Study. The objectives, research questions, sample, measures, data collection methodology, and analytic approach are summarized below.

Objectives and Research Questions

The primary objective of the Impact Study is to assess the effects of universal-free school breakfast on student outcomes. The Impact Study includes a broad range of outcomes measuring both short- and long-term goals of the SBPP. Key outcomes measured at the student level include school breakfast participation, breakfast consumption patterns, dietary intake, food security status, school attendance, child health, cognitive functioning, behavior, and academic achievement. Additional information was gathered from parents and teachers of students and from school records.

The Impact Study addresses three categories of research questions:

- Overall demonstration impacts of the **availability** of universal-free school breakfast,
- District-level and subgroup impacts of the **availability** of universal-free breakfast, and
- Effects of **participation** in school breakfast.

The primary research questions, which explicitly address the overall impact of the **availability** of universal-free school breakfast in the treatment schools (as distinct from the impact of actually participating), include the following:

- What is the impact of the availability of universal-free school breakfast on students' participation patterns?
- Are students for whom universal-free school breakfast is available more likely to consume breakfast than students in the SBP?
- Are students for whom universal-free school breakfast is available more likely to improve their dietary intake at breakfast and over 24 hours than students in the SBP?
- Do students with access to universal-free school breakfast demonstrate greater gains from the previous year in achievement on standardized tests than students without such access?
- Do students with access to universal-free school breakfast achieve higher scores on cognitive tests of attentiveness and memory than students without such access?
- Are students in universal-free school breakfast schools absent from school and tardy less often than students in the SBP?
- Do students with access to universal-free school breakfast exhibit better classroom behavior than students without such access as reported by their teachers and by the number of disciplinary incidents?
- Do students with access to universal-free school breakfast enjoy better health and a higher sense of food security than students without such access?

The experimental model used in this evaluation also provides for valid estimates of variations in impacts across subgroups. For example, this model can address the following key question: Do free or reduced-price eligible students benefit more from universal-free school breakfast than paid-eligible students? Similarly, the model can be applied to test for differential impacts between other subgroups, such as boys and girls, whites and non-whites, or older students and younger students.

While the above research questions are concerned with impacts based on availability of universal-free school breakfast, there is also great interest in addressing a number of questions dealing with the effects of participation in school breakfast for the sample as a whole, as well as for low-income students. These questions focus on variations in the effects of participation in school breakfast both across and within school districts, and on factors that may mediate the effects on student outcomes; for example, one question considers whether or not the food energy and nutrient content of breakfast affects cognitive functioning.

Sampling Design

The evaluation of the SBPP is based on an experimental design. This design treats school as the experimental unit with students nested within schools. The study sample for the Impact Study is comprised of elementary school students enrolled in grades two through six throughout the six participating school districts. Across the six participating school districts there was a total of 143 elementary school units grouped into 70 matched pairs[1] on the basis of several demographic variables (average enrollment, percent participating in school breakfast in SY 1999-2000, school meal eligibility status, average achievement test scores prior to implementation) to ensure comparability. One school unit in each pair was randomly assigned to the treatment group (universal-free school breakfast) and the other to the control group (SBP). Within each treatment and control school unit a sample of 30 students was targeted for participation in the study for a total student sample of 4,290 (2,190 treatment and 2,100 control).

The student sample was selected using a two-stage design to yield a random sample of students from the six participating school districts. In the first stage of sample selection, a total of six classrooms were randomly selected from each school unit in grades two through six.[2] In the second stage, a stratified random sample of eight students was selected, for a total of 48 students per school. The sample for the SBPP study was derived by stratifying the students in the selected classrooms according to school meal eligibility status and prior participation in school breakfast, when available. Samples of students were then randomly taken from each sampling cell, based on actual enrollment numbers in each school. Allowing for sample loss due to refusal, absenteeism, and mobility, an initial sample of 48 students was selected within each school unit to ensure a final analytic sample of 30 students per school by the end of data collection.

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[1] A total of 153 elementary schools are participating in the SBPP. For sampling purposes, however, combinations of schools with different grade configurations (e.g., K-2, 3-5) are considered as one school unit. In addition, in three school districts, two treatment school units were paired with one control group unit, yielding a total of 73 treatment and 70 control group school units.

[2] To reach the required number, one classroom was randomly selected from each grade (2-5 or 2-6) within each school unit. In addition, one or two other classrooms were then randomly selected from the school.

The sample design for the study was based on recommendations made in the Universal-Free School Breakfast Program Evaluation Design Project, Final Evaluation Design report (Ponza et al., 1999). As part of the initial sample design, statistical power calculations indicated a necessary sample size of approximately 4,000 students in 144 schools to estimate minimum detectable impacts under an assumption of a 25 percentage point increase in new participants with universal-free school breakfast. In order to maximize the efficiency of the data collection, it was decided that a two-stage stratified cluster sample would be used. That is, by clustering students within classrooms, the burden on school staff during all phases of the data collection would be minimized.

To reap the advantages of random assignment of schools, the student samples within each school were selected so that the respective groups remained statistically comparable on important characteristics across schools, such as school meal income eligibility status, prior participation in school breakfast, gender, and ethnicity. Otherwise, comparisons between treatment and control group students would be subject to selection bias, making less certain attributions of subsequent differences between the two groups to the treatment alone. The characteristics of the student sample are presented in further detail in Chapter Five and Appendix B.

To determine how well the actual final analytic sample (N=4,290) was representative of the original sample (N=6,864) and of the study population across all six school districts, a comparison was made using student school meal eligibility status. Exhibit B-1 in Appendix B displays the respective percentages of free/reduced-price eligibility for the two samples and population, both overall and across the six school districts. As the exhibit indicates, the percentage of free/reduced-price eligible students in the actual sample (54 percent) closely matches that of the original sample and the population (49 percent).

Data Collection Measures and Methodology

To meet the objectives of the Impact Study, data were collected from students, parents, teachers, and school records. With the exception of information gathered from student records, all of the Impact Study data were collected during a selected week (target week) at each school. This data collection occurred during Spring 2001, with sampled students interviewed and tested at their schools. Information from student records was collected separately, using procedures developed in collaboration with each of the six school districts participating in the demonstration.

The sources of information used to meet the Impact Study's objectives and research questions are summarized below:

- **In-person interviews with students** (joined by parent/guardian for the dietary recall) to obtain information on dietary intake at breakfast and for 24 hours, source of breakfast, usual breakfast pattern, school breakfast participation, attitudes about breakfast, and plate waste;

- **Tests of students' cognitive functioning** consisting of a battery of three cognitive tests assessing students' decision time on a match-to-sample task (Stimulus Discrimination), short-term auditory memory and attention abilities (Digit Span), and long-term verbal memory and retrieval (Verbal Fluency);

- **Direct assessment of students' height and weight** measurements;
- **In-person interviews with parents or guardians**, including questions concerning their child's dietary intake, use of dietary supplements, and usual breakfast patterns, and their own attitudes toward breakfast and school breakfast participation. Additional questions addressed child health and behavior, household socioeconomic characteristics, and food insecurity;
- **Questionnaires completed by teachers** concerning ratings of students' attitudes and behavior (Conners' Teaching Rating Scale and Effortful Control scale) and school climate (absenteeism, tardiness, physical conflict among students, student attitudes, and teacher morale); and
- **School records** on students' school breakfast participation, attendance, tardiness, disciplinary actions, school nurse visits, and academic achievement test scores.

All data were collected by local data collection teams in each of the six pilot project sites, with the exception of information obtained from school records that school or school district personnel extracted. Parental consent was obtained before any data were collected for individual students. Exhibit 4.1 summarizes the various forms of impact data collected from each group of respondents. A list of the data collection instruments available on the Food and Nutrition Service website is provided as Appendix H.

Exhibit 4.2 displays response rates across all students for a variety of data collection measures. The response rates for both student- and parent-level measures were based on the target number of expected students in the sample (N=4,290). The response rates for teacher ratings were based on the number of sampled classrooms (N=864). Finally, response rates for the nurse and disciplinary logs were based on the total number of schools in the sample (N=152)[3] times the number of weeks of data collection (N=20). Student record data, including outcomes on school breakfast participation, attendance, and academic achievement had response rates ranging from 80 to 97 percent, depending on the outcome and year in which it was collected.

Analytic Approach

This section presents the analytic approach to addressing the major research questions posed for the Impact Study. The discussion distinguishes between two types of research questions. One type comprises the questions that explicitly address the overall impact of the *availability* of universal-free school breakfast; the randomized experiment underlying the SBPP evaluation was designed to answer these questions with a high level of confidence. The second type of question addresses the effects of participation in school breakfast. While equally important in terms of their policy relevance, they are not necessarily built into the design in the same way. Therefore, statistical tests of differences cannot be conducted with the same statistical model or degree of confidence.

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[3] One school with students in grades k-1 only was not included in the Impact analysis.

Exhibit 4.1

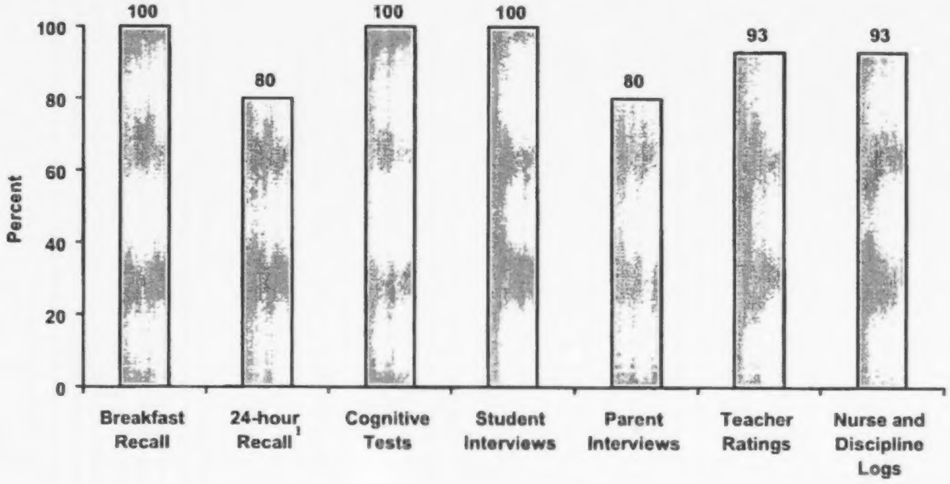
Summary of Impact Study Data Collection

Respondent	Target Sample Size	Mode	Outcomes
Students	4,290	In-person interviews (with parent/guardian for dietary recall)	• Dietary intake at breakfast/over 24 hours • Source of breakfast • Usual breakfast patterns/SBP participation • Attitudes about breakfast • Plate waste
	4,290	Direct assessment	• Cognitive functioning • Height and weight
	4,290	Record retrieval	• School breakfast participation • Achievement test scores[1] • Attendance/tardiness
	429	In-person interviews (with parent/guardian)	• Dietary intake at breakfast/over 24 hours (repeat assessment)
Parents or Guardians	4,290	In-person interviews	• Student's dietary intake and use of dietary supplements • Household food security status • Student's usual breakfast patterns • Child health • Parent/guardian attitudes toward breakfast and school breakfast • Socioeconomic characteristics of household
Teachers	864 (one per class with sampled students)	Self-administered questionnaires	• School climate
		Teacher ratings	• Student behavior
Schools	152	Record retrieval	• Attendance/tardiness • Disciplinary actions • School nurse visits • Achievement test scores • School breakfast participation

[1] Target sample sizes for achievement test scores were 3,249 for baseline year and 4,262 for first year of implementation.

Exhibit 4.2

Impact Study: Data Collection Response Rates Across All Districts



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[1] Response rate for 24-hour recall excludes second recalls. The response rate for parent-assisted second recalls was 90 percent.

Source: Impact Study Data Collection, Spring 2001

Analytic Models to Estimate the Overall Impacts of Universal-Free School Breakfast

The central questions posed by the Impact Study focus on the effects of universal-free school breakfast on student outcomes. One set of analyses examined impacts as static indicators at a single time point. Where two data points were available (e.g., student attendance), impacts on gain scores were computed. The underlying assumption in this analysis is that the final status or amount of gain on a given outcome measure best indicates the impact of universal-free school breakfast. The randomized design of the SBPP evaluation is most appropriate for answering questions about the overall impact of universal-free school breakfast on students.

The goal of an impact analysis is to compare observed outcomes for treatment school students with the expected outcomes for these students in the absence of the intervention. Because this counterfactual situation cannot be observed, the experiences of a control group were used as a proxy for what would have happened to the treatment school students in the absence of universal-free school breakfast. Because of random assignment, valid impact estimates were obtained based on simple comparisons of means and proportions between treatment and control school students. Continuous outcomes were analyzed using a hierarchical mixed-model approach, while binary outcomes were modeled using logistic regression. These models provided for estimates of the overall as well as district-level impacts. The specific formulation of these models is described in further detail in Appendix C.

Impact estimates were improved by controlling for differences in a number of baseline characteristics of students related to outcomes. Estimates were improved in that they are more precise; they reach higher levels of statistical power through the removal of these controlled sources of variation from the error term in the impact model. A separate multivariate analysis was conducted for each outcome variable using a set of baseline covariates to increase the precision of the analytic estimates and to help adjust for any initial differences between the treatment and control groups. The covariates used in the student-level models were as follows:

- Age of student in months and years;
- School meal eligibility status (free and reduced-price versus paid);[4]
- Student gender; and
- Student minority status (white versus non-white).[5]

These same covariates were used in all of the student-level models. In addition, for a subset of outcomes, a baseline measure of the outcome (e.g., academic achievement test score) was available and included in the model. Missing data for any of the student-level demographic variables were imputed using the school-level mean. Missing data for baseline measures of outcomes (e.g., attendance) were not imputed given that the baseline value was used in estimating the gain score for each student. Consequently, the gain score analyses only included students with data at two time points.

Impact analyses were also conducted on a number of outcomes for which data were available for the entire school, including school breakfast participation, attendance and tardiness, academic achievement, disciplinary incidents, and school nurse visits. These data were analyzed to determine if there were any impacts of universal-free school breakfast on all students in the school, not just those students in the study sample.

The experimental model also provided for valid estimates of variations in impacts across subgroups by addressing the question of whether there is a differential impact of universal-free school breakfast on two groups of students who differ only on a baseline characteristic, such as minority status or gender. Parallel to the approach to assessing overall impact using school-level means, variations in impacts for subgroups were assessed by examining the cross-level interaction between student-level characteristics and the treatment status of the school. For example, results from the model could indicate that students eligible for free or reduced-price meals benefit from the school breakfast more than students in the paid category. Subgroup analysis was conducted on four student-level covariates: school meal eligibility status, minority status, gender, and grade. Appendix C provides a more complete description of these models.

Analytic Approaches to Measuring Effects of Participation in School Breakfast

As noted at the outset, the estimates described above measure the average impact of the *availability* of SBPP on all students, including those who did not participate in the program. For many purposes, it is also of interest to measure the impact of the program on just those students who did participate. Several different approaches were used to derive estimates of the impact on participants. These analyses depend on assumptions that make the attribution of observed differences in outcomes somewhat less certain than the level of reliability associated with impacts derived directly from the experimental design.

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[4] Free and reduced-price students showed similar participation patterns and were therefore combined for simplicity.

[5] Minority categories of black, Hispanic, Asian, and other were combined into non-white because of the relatively small numbers of students in these groups in some school districts.

The research questions addressed in these analyses were:

- What is the effect on participants of school breakfast participation on the target school day?
- What is the effect on participants of school breakfast participation over the course of a school year?
- What is the effect of change in participation in school breakfast on student outcomes?
- Is there a relationship between consumption of breakfast and student performance on cognitive measures administered on the same day?
- Do schools that serve breakfast in the classroom have higher participation rates, and, as a result, more positive outcomes?

The analyses of the impact of universal-free school breakfast are based on the difference in outcomes between the *entire* treatment sample and the *entire* control sample in each school. These estimates indicate the impact of making school breakfast universally available in the treatment schools. These estimates, however, understate the effect of universal-free school breakfast on participants to the extent that some proportion of the students in the treatment schools did not take full advantage of the universal-free school breakfast offered. In addition, there was also a proportion of students in control group schools who did participate in the SBP.

To estimate the effect of universal-free school breakfast on participants (i.e., the first two research questions), a set of statistical procedures (see Bloom, 1984) was used to adjust the estimate of average impact on the entire treatment group.[6] The adjustment was based on either the difference between the proportion of treatment and control students eating breakfast on a typical school day or the incremental difference in cumulative participation between the two groups over the entire school year. The only assumptions required for this adjustment are (a) that universal-free school breakfast has a zero impact on students who did not receive school breakfast and (b) that participation in universal-free school breakfast has the same effect as participation in the SBP offered in the control schools.[7] In particular, it is not necessary to make any assumption about the selection process that

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[6] In a parallel set of analyses, the effects of participation were looked at for a group of low-income students.

[7] It must be reiterated, however, that any adjustment applied merely establishes an **upper bound** on the impact of those students who **did** participate in the treatment. If the assumption (a) that the non-participants received no impact from universal-free school breakfast should not be met, then the adjusted impact would consequently be of lower magnitude. For example, it may well be that implementing universal-free school breakfast in a school has effects on all students, regardless of their participation. This could come about through an effect on the overall school climate positively benefiting student outcomes. Alternatively, if assumption (b) is not met, for example, as a result of control school students receiving a qualitatively different breakfast, adjustments to impact estimates could be unduly biased upwards or downwards. It must be noted, however, that results from both the School Climate and Breakfast Menu Surveys do not indicate either that the school environment or what students were served at breakfast were affected by the availability of universal-free school breakfast.

generated the non-participants. Under these assumptions, this adjustment provides an **unbiased** estimate of the impact of universal-free school breakfast on the participants in the treatment schools. See Appendix C for further details on the use of this adjustment procedure and Appendix F (Exhibits F-1 to F-13) for a report of the adjusted results.

In addition, a variety of analytic approaches were employed to deal with the last three research questions that, because of the design, have to be analyzed in a non-experimental framework. For this set of research questions, estimates were obtained, but they are not based on an experimental design. Specifically, these questions ask about variations in the effects of universal-free school breakfast both across and within school districts, and about the effects of mediating variables on student outcomes. The results of these analyses are presented in Appendix F (Exhibits F-14 to F-23).

The first set of these non-experimental analyses is based on individual students' level of school breakfast participation (Exhibits F-14 to F-19). Specifically, these analyses answer the question of whether students who experience greater changes in participation in school breakfast also experience better outcomes as compared to students who do not change their level of participation in school breakfast.

A second set of analyses looks at the effect of breakfast consumption on cognitive outcomes, independent of treatment status (Exhibits F-20 to F-21). That is, do students who eat a substantial breakfast score higher on measures of cognitive functioning than students who eat a less substantial or minimal breakfast? These analyses are not tied to the experimental design and thus attribution of observed differences in outcomes is less certain.

Finally, the Impact Study looks at variation in impacts across schools (Exhibits F-22 to F-23). That is, do students experience different levels of outcomes depending on the overall school level of participation in school breakfast? Of particular interest here is the question of whether or not schools that serve breakfast in the classroom attain higher participation rates and consequently also better student outcomes than schools that serve breakfast elsewhere. A total of 18 treatment schools served breakfast in the classroom. The sample for this nonexperimental analysis consisted of these schools plus each school's paired comparison school(s). Since schools were not randomly assigned to mode of breakfast delivery, the usual caveats about causal attribution apply.

Chapter Five

Impact of the Availability of Universal-Free School Breakfast on Students

This chapter presents results from the analyses conducted to assess the impact of the *availability* of universal-free school breakfast on student outcomes. In these analyses, the rigor of the experimental design is fully utilized to address the main question concerning program impact. Specifically, do students in schools where universal-free school breakfasts are available do better across a number of outcomes than students in the control schools?

Key findings from these analyses include:

- Participation in school breakfast showed a significant gain overall in favor of treatment school students. This effect varied significantly from district to district, and was greater for students with paid eligibility status.

- Most students in both treatment and control schools ate something for breakfast and did so all five days of a typical school week. The likelihood of consuming breakfast on a given day was slightly higher among students in treatment schools when breakfast was defined as providing a minimum level of food energy and foods from at least two food groups.

- Universal-free school breakfast was associated with a higher likelihood of eating more than one nutritionally substantive breakfast, typically at home and at school. Few students had adopted this eating pattern, but those that had experienced significantly higher total food energy intakes than students who did not eat more than one breakfast.

- There was little effect of universal-free school breakfast on students' food or nutrient intake, either at breakfast or over 24 hours. Significant differences in food and nutrient intake were generally in a positive direction but were few in number and of very small magnitude. The great majority of students overall consumed a usual diet that provided more than 80 percent of the RDA for food energy and protein and was adequate in vitamins and minerals. On the other hand, few met recommendations for total fat, saturated fat, and sodium.

- There were no significant differences between treatment and control students on measures of academic achievement (reading and math); cognitive or social/emotional functioning; attendance; tardiness; food insecurity; or children's health, including parent reports of health and visits to the school nurse.

- Treatment schools reported significantly higher rates of disciplinary incidents overall than control schools, and these differences were due to incidents that took place in the morning.

- There was no difference in the share of treatment versus control school students at risk of overweight or overweight as measured by the body mass index.

Details of these findings are presented below. The chapter begins with some descriptive information about students in the Impact Study, as well as the results of a comparison of treatment and control school students on these key demographic indicators. The findings on the various student outcomes are then discussed. Preceding the presentation of findings for each outcome is a short description of expected effects (based on the conceptual model and prior research), the measures used, data sources, and the analytic variables created.

The main finding discussed in each section is the average impact across all school districts. If there is significant variation in impact among districts, then this is also presented and the relative magnitude of treatment effects among districts is discussed. To aid the reader in interpreting the magnitude of results, effect sizes for continuous outcomes (e.g., scores on cognitive tests)[1] and odds ratios[2] for binary outcomes (e.g., students reported to be in excellent health) are included to provide a standard comparison scale in all the exhibits. A general rule of thumb in social science research has been to regard effect sizes of below .20 as not "educationally meaningful" (Cohen, 1977). In turn, conventional guidelines have been established to consider effect sizes between .20 and .50 as "small" and potentially meaningful, effect sizes between .50 and .80 as "moderate" in magnitude, and effect sizes of .80 and above as "large". As a corollary, an effect size of .20 is equivalent to an odds ratio of 1.44, an effect size of .50 is equivalent to an odds ratio of 2.48, and an effect size of .80 is equivalent to an odds ratio of 4.27.[3]

Results that are not statistically significant are not discussed in depth, but readers can find detailed tables of the overall and individual district results in Appendix D. Finally, the analysis of subgroup impacts is also presented with associated tables found in Appendix G.

Given that a joint set of hypothesis tests are performed on the same outcome (i.e., by district and subgroup), it is important to note the increased risk of finding significant differences when they do not really exist (i.e., Type I errors). For example, with a statistical significance cutoff of .05, one estimate out of 20 is likely to be significant by chance alone. If 10 statistical tests are performed on the same set of data, each of which has a 1 in 20 chance of yielding a false positive result ($p = .05$) the probability of not committing a Type I error is only $(.95)^{10}$ or 60 percent. In light of this, this report primarily focuses on consistent patterns of findings, while scattered significant results from several tests are treated as possibly due to chance. While a Bonferroni-type adjustment to control for a Type I error across the complete set of comparisons is not adopted here, the reader is reminded to be sensitive to this risk given the many statistical tests conducted.

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[1] An effect size expresses the impact in terms of standard deviation units, and by doing so allows one to more easily compare results from outcomes using different scales of measurement.

[2] An odds ratio for a treatment versus control group difference is the odds of success in the treatment group divided by the odds of success in the control group. An odds ratio equal to one means that the control and treatment groups are equally likely to have success. An odds ratio of two means that the treatment group is twice as likely to have success as the control group.

[3] By extension, when looking at negative outcomes, where "1" = a failure (e.g., having a health problem), the corresponding criteria for judging odds ratios are "small" = .69, "moderate" = .40, and "large" = .23.

Description of Sample at Baseline

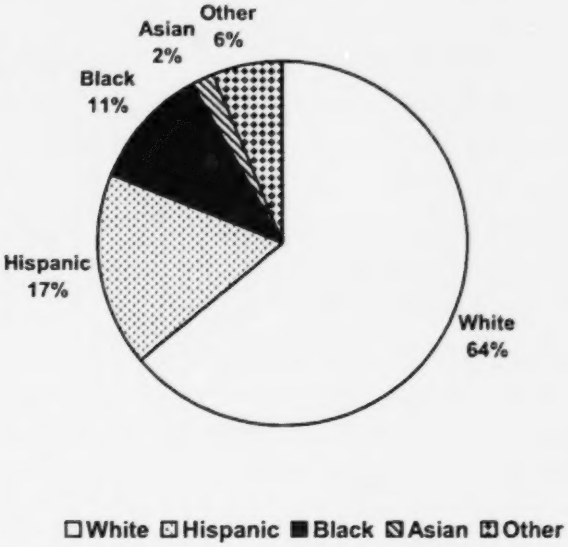
Sample Characteristics

Baseline data on sample children were gathered from both school records and parent interviews.[4] Some key characteristics of the study sample are listed below.

- **Race/Ethnicity**: The student sample is predominantly white (64 percent). Exhibit 5.1 shows the breakdown by specific categories for those students whose parents/guardians were interviewed and provided information on family ethnicity.

Exhibit 5.1

Ethnic Distribution of Student Sample



N=3,410

Sources: Impact Study – Parent Survey, Spring 2001

In terms of ethnic breakdown, the sample is fairly similar to national percentages. According to 1999 data from the National Center for Educational Statistics, the ethnic makeup of the national elementary and secondary student population was 62 percent white, 16 percent Hispanic, 17 percent black, and 5 percent other.

- **Gender**: The student sample is fairly evenly split in terms of gender: 52 percent boys and 48 percent girls.

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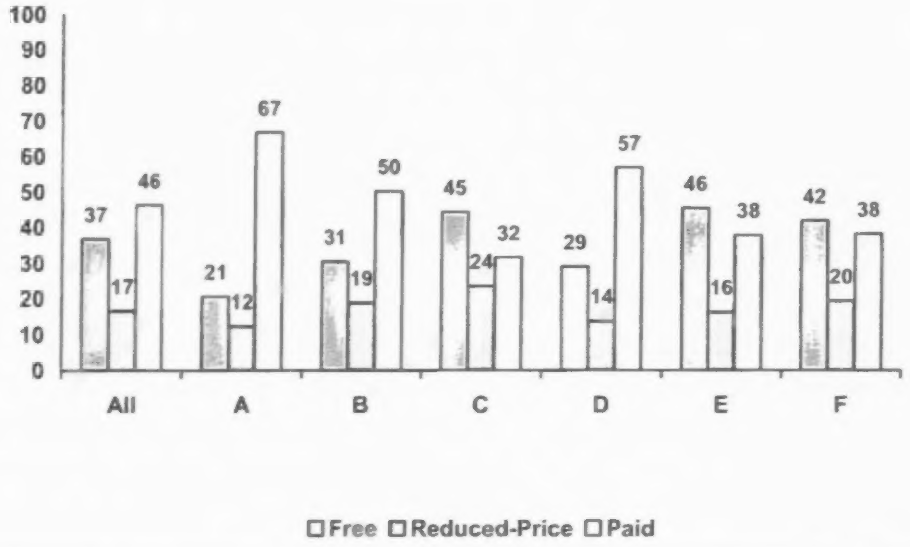
[4] Although parent interviews were conducted in Spring 2001, there was no expectation that the implementation of universal-free school breakfast would have any impact on child/family demographic characteristics.

- **Age:** The average age of the students is a little under 10 years old (9.8). Because of the classroom selection method, slightly more than half of the sample (54 percent) is in grades two and three.

- **School Meal Eligibility Status:** A little more than half of the student sample (54 percent) across all schools falls into the free or reduced-price eligibility category. This number is somewhat higher than the percent of the student population in these categories in the six participating school districts in the study (49 percent, see Exhibit B-1). Exhibit 5.2 shows the breakdown of school meal eligibility status overall and by district. Across districts, the percent of free or reduced-price eligible students ranges from a low of 33 percent in District A to a high of 69 percent in District C.

Exhibit 5.2

School Meal Eligibility Status for the Student Sample, by District and Overall



N=4,298

Source: *Impact Study – Student-Level School Records, 2000-2001 (Data was verified and missing data completed using student-level School Records, 1999-2000, School Rosters, 2000-2001, and Parent Survey, Spring 2001)*

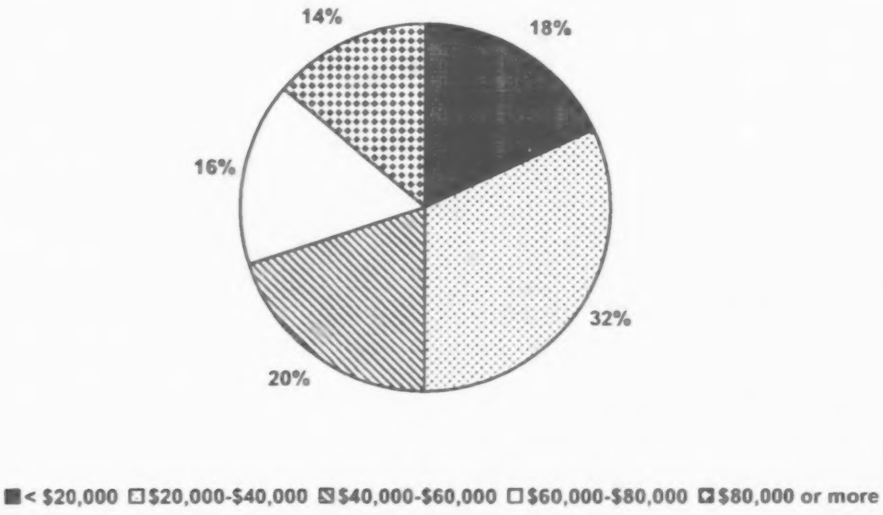
- **Parent/Guardian's Education Level:** Only 11 percent of the parents/guardians interviewed indicated that they did not graduate from high school. Almost a quarter (24 percent) possessed a college degree.

- **Household Income:** Only 18 percent of the parents/guardians interviewed indicated that their household income was less than $20,000 annually. Exhibit 5.3 shows the distribution of income levels among sampled students' households.

- **Family Structure**: One quarter of the students lived in a single-parent family.

Exhibit 5.3

Distribution of Household Income



N=3,326

Sources: *Impact Study – Parent Survey, Spring 2001*

Comparability of Treatment and Control School Samples

The randomization procedures implemented as part of the SBPP experimental design were intended to result in statistically comparable treatment and control group samples at the outset of the evaluation. Given this strong research design, it was important to investigate whether the two study samples were indeed comparable on a number of key demographic characteristics. A series of statistical tests were conducted whereby the treatment and control school samples were compared on the following characteristics[5]:

- School meal income eligibility: free/reduced-price versus paid
- Ethnicity: non-white versus white
- Gender: female versus male
- Student's age: in years
- Parent's education: did not graduate from high school
- Parent's education: college degree or higher
- Family structure: single-parent
- Household income: less than $20,000 per year
- Household income: greater than $70,000 per year
- Child health: chronic health problem

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[5] Tests on school meals eligibility, ethnicity, gender, and age were based on all students in the full analytic sample (N=4,298). An additional series of comparison tests showed that parent survey respondents (N=3,375) were also statistically comparable on these four student characteristics.

The results of these tests are presented in a series of exhibits in Appendix B. These exhibits are based on the unadjusted means of the treatment and control groups. Overall, there were no statistically significant differences on these characteristics between students in treatment and control schools.[6] At the school district level, there were a total of six significant differences ($p < .05$) across these ten characteristics out of a total of 60 possible tests (see Appendix B). By chance alone, however, we would expect three of these tests ($.05 * 60$) to be statistically significant. Based on these results, we can conclude with a good deal of confidence that the treatment and control school samples used in this study are likely to be statistically comparable. Therefore, the results of the impact analyses reported here are highly likely to be attributable to effects of universal-free school breakfast rather than to baseline student characteristics.

Impacts on School Breakfast Participation

School breakfast participation plays a critical role in the evaluation of the SBPP. Increasing the currently low level of school breakfast participation among poor students was identified as the primary reason for school districts to apply for the demonstration. In addition, as noted in the conceptual model presented in Chapter One, participation serves as the pathway through which short- and long-term outcomes are realized. In Chapter Three, changes in participation due to the implementation of the SBPP were reported for descriptive purposes at the school level. In this section, the impact of the program on changes in participation at the school and student level (i.e., for those students in the Impact Study sample) are analyzed.

Increased participation has been shown to be a result of the implementation of universal-free school breakfast programs across the country, although the magnitude of the increase has varied. In Minnesota's Fast Break to Learning Program, the universal-free breakfast schools saw a significant increase over control schools, but the magnitude was only 7 percentage points (from 39 to 46 percent; Peterson et al., 2001). This increase was somewhat greater (12 percentage points) for those eligible for reduced-price meals. In contrast, other studies have reported increases of about 45 to 65 percentage points (Murphy et al., 2001a; Murphy and Pogano, 2001). These latter findings refer to universal-free school breakfast programs that have served breakfast in the classroom in Baltimore and throughout Maryland.

Measures and Analytic Variables

For five of the six districts, the participation data came from the same electronic point-of-service accountability system. The Student Nutrition Accountability Program (SNAP) tracks individual student participation in the School Breakfast Program on a daily basis. The five districts using SNAP provided school-level (reported in Chapter Three) and student-level participation data electronically from the SNAP software files for SY 1999-2000 and 2000-2001. In the sixth district (District C), breakfasts are recorded on hardcopy forms that cover a two-week period. None of the control schools and only four of the treatment schools in this district could provide student-level data on participation. Thus, student-level analyses could not be conducted for this district.

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[6] In addition, the full set of racial/ethnic and income level categories were used to test for statistical comparability. In neither of these categories were the treatment and control group samples statistically different.

For our purposes, School Breakfast participation is defined as the number of meals served divided by the number of days school is in session. It is unadjusted for a student's attendance at school, since attendance is one of the outcomes that also could be affected by the implementation of the universal-free school breakfast. Participation in this section is defined as participation over time, usually across the entire school year. Participation on the target day is also considered in this report in later sections.

Findings

Implementation of universal-free school breakfast did lead to significant increases in participation in the treatment schools (Exhibit 5.4). Overall, participation in the treatment schools increased by 17 percentage points (from 19 to 36 percent). Students in the control schools also increased their participation by about 1 percentage point (from 19 to 20 percent). The overall net gain attributable to the implementations of universal-free school breakfast is thus 16 percentage points, which is significant at the .01 level. Each district also had significant increases in participation. However, there was a significant treatment status-by-district interaction ($p<.01$), indicating that the size of the increase varied by district. The net increase for treatment schools ranged from 7 percentage points for schools in District D to 33 percentage points in District F, the district where students in all the treatment schools ate breakfast in the classroom.

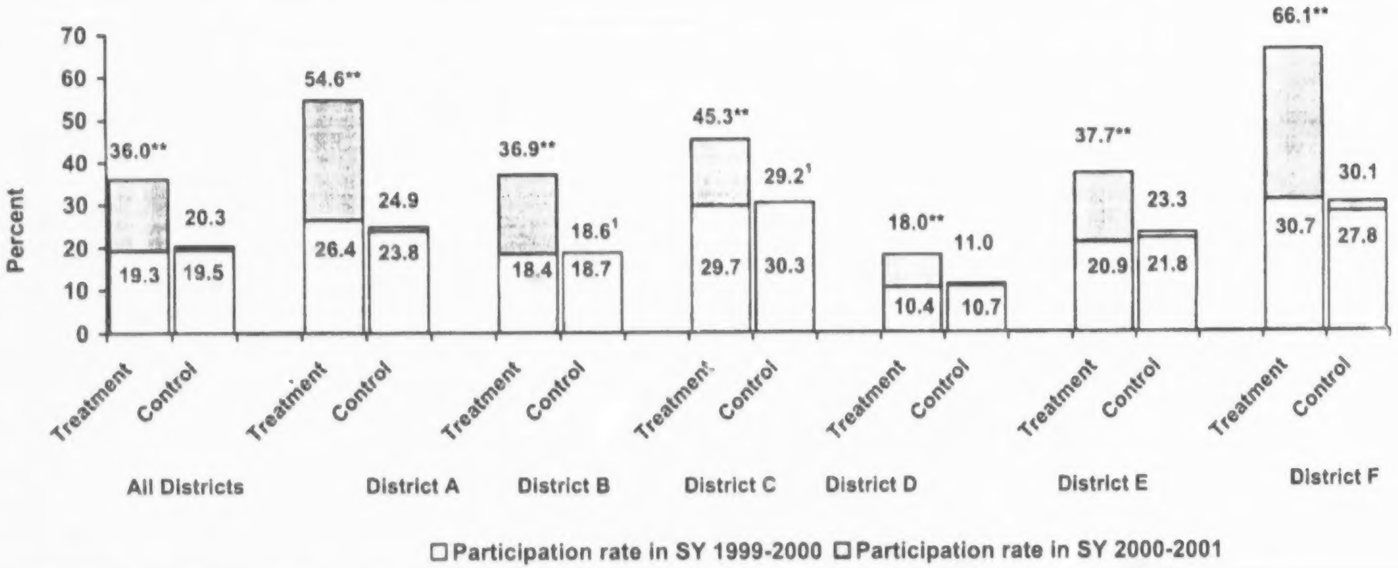
Analyses of participation data for sampled students revealed the same pattern of findings as for schools. When the data for sampled students were analyzed by subgroups, significant differences also emerged. In assessing the effects of school meal eligibility status, the results indicated that students with paid eligibility in the treatment schools show a greater jump in participation when compared to their control counterparts than free or reduced-price eligible students ($p<.01$; Exhibit 5.5). In a comparison of differences between white and non-white students, the impact of universal-free breakfast on participation was in favor of white students (19.4 percentage point gain) when compared to non-whites (16.1 percentage point gain) ($p< .01$; Appendix G, Exhibit G-5). The interaction of minority status with district was also significant ($p< .05$). The only district with a significant difference on the white-non-white comparison was District F, where the increase in white participation was dramatic relative to the non-white increase (39.9 versus 16.5 percentage points, $p< .01$). This is most likely because breakfast was eaten in the classroom in this district, which increased the participation of students with paid eligibility, who tended to be white.

Impacts on Breakfast Consumption Patterns

A principal goal of the School Breakfast Program (SBP) is to ensure that all school children have access to a nutritious breakfast to promote learning readiness and healthy eating behaviors. Evidence that this goal has been achieved, however, is mixed. Previous research has shown that the impact of the availability of the SBP on the likelihood of eating breakfast depends on how breakfast is defined and on family income (Devaney and Stuart, 1998). When eating breakfast is considered the consumption of any food or beverage in the morning, the availability of the SBP does not increase the likelihood of eating breakfast. When breakfast is defined more substantively as consisting of more than 10 percent of the Recommended Dietary Allowance (RDA) for food energy, the availability of a breakfast program at school increases the likelihood of eating breakfast, but only among low-income students. Thus, important issues in interpreting the impact of universal-free school breakfast on

Exhibit 5.4

School Breakfast Participation in School Years 1999-2000 and 2000-2001, Overall and by District



N=151

[1] Participation rate decreased from SY 1999-2000 to SY 2000-2001.

** Difference in participation gain from SY 1999-2000 to SY 2000-2001 between treatment and control students is statistically significant at the .01 level.

Sources: *Impact Study – School-Level School Breakfast Participation Data, 1999-2000 and 2000-2001*

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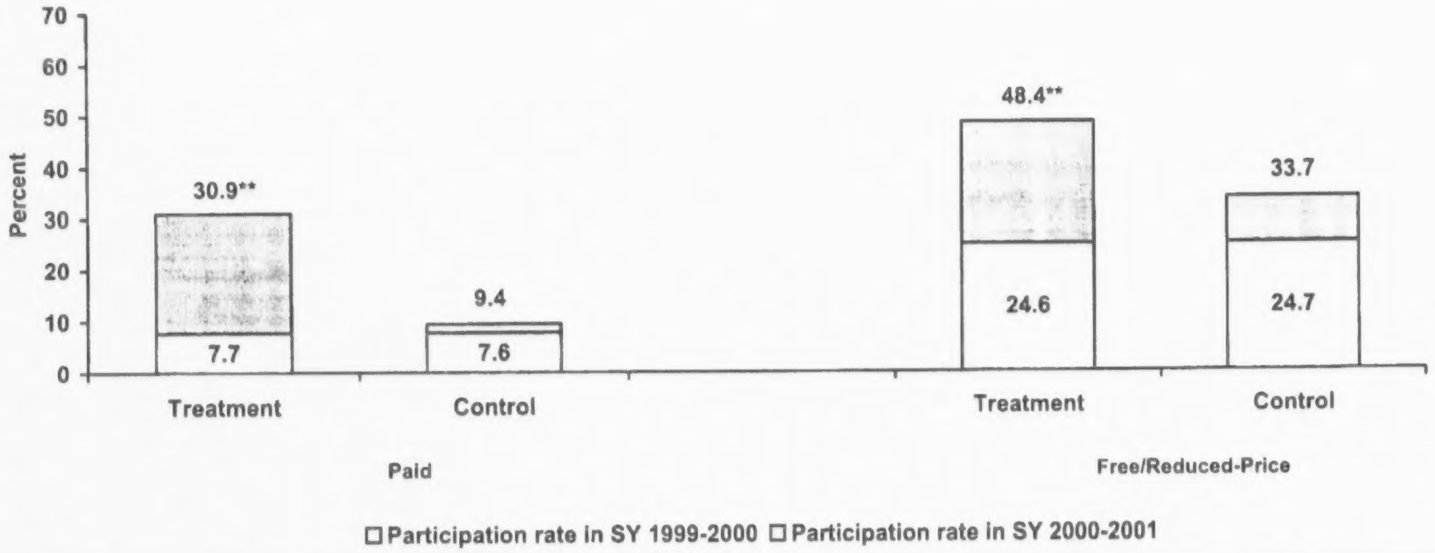
Exhibit 5.5

Overall Gains in School Breakfast Participation of Sampled Students from School Year 1999-2000 to 2000-2001, by School Meal Eligibility Status[1]



N=3,380

[1] District C could not provide student-level data for this analysis.

** Difference between gains in participation for paid and free/reduced-price students is statistically significant at the .01 level.

Sources: Impact Study – Student-Level School Breakfast Participation Data, 1999-2000 and 2000-2001

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students' breakfast consumption patterns were breakfast definition and differences in consumption patterns by demographic and socioeconomic characteristics of the student. These issues were considered in the development of analytic variables and the subgroup analyses discussed below.

In the current evaluation, all students had access to a school breakfast program, but it was expected that students with universal-free school breakfast available would be more likely to consume breakfast on a given day than students with access to the regular School Breakfast Program (SBP). Usual breakfast consumption was also expected to increase with the provision of free breakfasts to all students. These hypotheses were based on reasoning that students who do not typically eat breakfast before coming to school, for whatever reason (e.g., food not available/affordable, not hungry early in the morning, no adult supervision to ensure breakfast is eaten, etc.), would now have the opportunity to eat breakfast at school, a little later in the morning and free of charge. For students already eligible to have a free breakfast at school (low-income students) but not taking advantage of the SBP, making breakfasts universally free might remove any stigma associated with participating and increase the likelihood that they eat breakfast, at least on school days. In addition, in schools where universal-free school breakfast was served in the classroom, students would be able to eat breakfast more conveniently, as part of their school day.

A potential inadvertent effect of offering school breakfasts free of charge is that some students may consume more than one breakfast. For example, they may eat breakfast at home, and then, since it is free, eat a portion or all of the breakfast available at school. This could lead to excessive intakes of food energy and other dietary components. On the other hand, if some students consumed a nutritionally inadequate breakfast before coming to school, eating a second breakfast could have a positive influence on their overall dietary intake. While it was expected that more students attending schools with the universal-free school breakfast would consume foods both at home (or some other place) and at school than their SBP counterparts, it was not known to what extent this might be considered a negative outcome of the program.

The analyses reported here address the question of whether the availability of universal-free school breakfast is associated with a greater likelihood of consuming breakfast both on a given day and usually. They also attempt to shed light on the question of whether free breakfasts are associated with the consumption of more than one nutritionally substantive breakfast and excessive food energy intake.

Measures and Analytic Variables

The primary measures of students' breakfast consumption patterns were: (1) the prevalence of consuming breakfast on a typical school day and (2) the prevalence of consuming more than one breakfast in a day. Both measures were based on data collected in a dietary recall interview with the students at school. Interviews were conducted in the morning, after school breakfast had been served and before lunchtime. Students were asked to report everything that they had to eat and drink from midnight up to the time of the interview, including the name and time of each eating occasion, the amounts eaten, and the source of the food (e.g., home, school, restaurant). Amount estimation tools and sample school breakfast food items were available to aid the students in reporting portion sizes.

A standard, "multiple-pass" approach for obtaining dietary intake information was used to reduce underreporting, a common problem in dietary data collection, especially among young children. It allows multiple opportunities for the respondent to fully remember his or her food intake over a 24-hour period and has been used in both the Continuing Survey of Food Intakes of Individuals (CSFII) and the National Health and Nutrition Examination Surveys (NHANES). In these large national surveys, children age 6 to 11 are interviewed with a parent's assistance. In other large studies, for example, SNDA-I, the Child and Adolescent Trial for Cardiovascular Health (CATCH), and the Dietary Intervention Study in Children (DISC), only students in third grade and higher were interviewed without their parent or other caregiver present. Since the breakfast portion of the recalls in the current study was collected directly from all students, including those in second grade, several strategies were employed to enhance the reliability and validity of results. For example, parents were asked to report their child's morning food intake to confirm their child's report. If the parent prepared or served the meal or was present when their child ate breakfast, interviewers were instructed to use information provided by the parent rather than the student. Parents were not, however, able to verify or correct their child's report of food eaten (and food wasted) in school. Samples of the school breakfast food items, a menu list with a description and the serving size for each item, a food record completed by the child's parent, and additional probes for beverages and snacks were also used to help obtain complete and accurate information from the students. Finally, interviewers were trained to flag recalls if they felt that they were unreliable or if the student or parent indicated that the amount reported eaten was atypical for any reason.

Foods that counted as "breakfast" included all foods reported consumed between 5:00 a.m. and 45 minutes after the start of school, and foods consumed up to 10:30 a.m. that the student reported as being part of breakfast.[7] The following definitions of breakfast consumption[8] were then used to categorize students who consumed versus skipped breakfast:

1. Consumption of any food or beverage (except water);
2. Consumption of foods from at least two of five main food groups[9] and breakfast intake of food energy greater than 10 percent of the RDA; and
3. Consumption of foods from at least two of five main food groups[9] and breakfast intake of food energy greater than 15 percent of the RDA.

Definition 1 was intended simply to identify students who broke the overnight fast with something other than water. Breakfasts under definition 1 could be substantial or they could include as little as a piece of candy, a glass of juice, or a slice of toast. Definitions 2 and 3 were intended to identify only those students who consumed a more nutritionally substantive breakfast. Some examples include cereal and milk; juice or fruit, a muffin, and milk; and egg, sausage, biscuit, milk, and juice. Students were considered to have eaten more than one breakfast if their breakfast food intake met the criteria for the more substantive breakfasts (definitions 2 or 3) at each breakfast eating occasion. Since the study is focused on the effects of the availability of school breakfast, only students who met the criteria for consuming more than one breakfast, both at school and at least one other source (usually home), were included in the analysis for consumption of more than one breakfast.[10]

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[7] The breakfast period was extended past 45 minutes after the start of school because some schools offered breakfast mid-morning rather than at the start of the school day (see Appendix E).

[8] The selection of breakfast definitions began with some preliminary analyses of breakfast consumption using three definitions recommended by Devaney and Stuart (1998) based on their reanalysis of data from the School Nutrition Dietary Assessment Study-I (SNDA-I). These results were shared with several school breakfast experts and FNS. It was agreed to consider an even more robust definition than Devaney and Stuart's for this evaluation in the event that it would be more sensitive to changes in breakfast consumption, especially among lower-income students. Ultimately, it was decided to use three breakfast definitions. Definitions 1 and 2 were two of the three recommended by Devaney and Stuart; definition 3 called for a higher minimum food energy content of the breakfast.

[9] The five food groups used are: (1) milk and milk products; (2) meat and meat equivalents; (3) grain products; (4) fruits and fruit juices, and (5) vegetables and vegetable juices.

A secondary measure of breakfast consumption patterns was developed from parents' interview responses to questions about their child's breakfast consumption during the previous school week. This measure was intended to reflect students' usual breakfast consumption. Prior to the interview, parents were asked to complete a log of whether and where the sample child ate breakfast. The interviewer then asked for the days of the week their child had breakfast at home, at school, and somewhere else (e.g., child care, restaurant, in the car). A variable was created that identified students whose parent reported they had eaten breakfast all five days.

Sources of Breakfast

It is important to consider the effects of universal-free school breakfast on students' breakfast consumption patterns in the context of where breakfast food items were obtained. Exhibit 5.6 shows the sources of breakfast (based on definition 1) among students on the target day when they were interviewed by treatment group. Students in the schools that offer universal-free school breakfast were more likely to consume food from the SBP and less likely to eat breakfast at home relative to students in control schools. They were also twice as likely to eat something both at home and at school. However, since the vast majority of students in control schools (96 percent) also consumed breakfast, it seems that, in the districts included in this study, offering breakfast free of charge affects where food is obtained, not so much whether or not any breakfast is eaten.

Exhibit 5.6

Sources of Breakfast Among Students on the Target Day[1]

	Treatment Schools	Control Schools	Difference
		Percent of Students	
Any SBP breakfast	49.0	27.4	21.6
School breakfast only	28.4	16.6	11.8
School and home or other breakfast[2]	20.7	10.8	9.9
Non-SBP breakfast	47.6	69.0	-21.4
Home breakfast only	43.7	64.0	-20.3
Other breakfast only	2.5	2.6	-0.1
Home and other breakfast	1.4	2.4	-1.0
No breakfast eaten	3.4	3.6	-0.2
Number of Students	2,212	2,066	

[1] Tests for statistical significance were not conducted on these data.

[2] Only 1 percent of all students had something from school and something from a source other than home (e.g., restaurant).

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

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[10] Only a small proportion of students (less than 2 percent) reported consuming something for breakfast from home and from a source other than school.

Findings

This section presents results from the analysis of impacts of universal-free school breakfast on students' breakfast consumption, both on a given day and usually, as well as impacts on the prevalence of consuming more than one substantive breakfast per day.

Breakfast Consumption

The principal finding from the analysis of students' breakfast consumption patterns is that the availability of universal-free school breakfast is associated with a small increase in the likelihood of consuming breakfast when breakfast is defined with either of the more substantive definitions (definition 2 and 3). More than 6 out of 10 students in both treatment and control schools were eating a breakfast that provided these levels of nutrition. Furthermore, most students ate or drank something for breakfast and did so all five days of a typical school week.[11]

Exhibit 5.7 presents graphically the prevalence of eating breakfast on a given day, showing the comparison between treatment and control school students for each breakfast definition. When breakfast was defined as any food or beverage eaten (definition 1), there was no difference in the likelihood of consuming breakfast among students with access to universal-free school breakfast compared with their SBP counterparts.

When breakfast was defined as providing at least 10 percent of the RDA for food energy and food from two different food groups (definition 2), treatment school students were significantly more likely than controls to consume breakfast. The increase was a modest 4.2 percentage points for all districts combined (odds ratio = 1.28). Somewhat contrary to expectations, this effect was not as large when breakfast was defined with a higher minimum food energy criterion. In District F, the impact of universal-free school breakfast was quite a bit larger than the overall finding (Appendix D, Exhibit D-3). As might be expected from the high rate of gain in school breakfast participation in this district, there were large, statistically significant increases in consumption of both of the more substantive breakfasts (increases of 19.0 and 17.2 percentage points, $p<.01$). Findings for other student outcomes in this district, however, did not consistently demonstrate effects of the intervention.

Based on a breakfast definition comparable to definition 1, students in schools offering universal-free school breakfast were significantly more likely to eat breakfast all five days of the school week than students in control schools ($p<.01$; Exhibit D-5). This difference was slightly more than 4 percentage points overall. The apparent difference between findings for breakfast consumption on a given day and findings for usual breakfast consumption may reflect differences in the source of data (student versus parent report).

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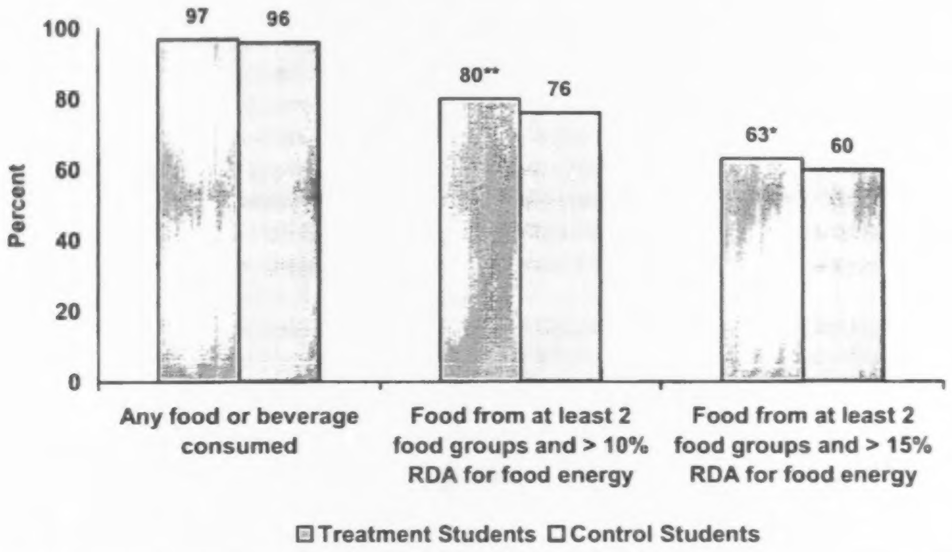
[11] Breakfast skipping was considerably less prevalent among students in both treatment and control schools (3.4 and 3.6 percent, respectively) compared with national estimates. Data from the 1994-1996 CSFII suggest a range of 8 to 15 percent for children 6 to 13 years of age with the older children (9 to 13 years old) more likely to skip breakfast than the younger students (6 to 8 years old) (Gleason and Suitor, 2001). The 1992 estimate for elementary school students from SNDA-I was 7 percent (Devaney and Stuart, 1998).

Exhibit 5.7

Percent of Students Eating Breakfast on the Target Day, by Breakfast Definition



N=4,278

- * Difference is statistically significant at the .05 level.
- ** Difference is statistically significant at the .01 level.

Source: *Impact Study – 24-Hour Dietary Recall Interview, Spring 2001*

The impact of universal-free school breakfast on breakfast consumption was similar overall regardless of students' school meal eligibility status, minority status, gender, or grade.

Consumption of More Than One Breakfast

The availability of universal-free school breakfast was associated with a greater likelihood of eating two or more substantive breakfasts,[12] but few students overall followed this eating pattern. Students in both treatment and control schools who consumed more than one substantive breakfast had, on average, higher total food energy intakes than those who did not eat two or more breakfasts.

Results of the analysis of the prevalence of consuming more than one breakfast are summarized in Exhibit 5.8 (and Exhibit D-4) for each definition of breakfast. The proportion of students eating *any* food or beverage for breakfast from more than one source was significantly higher among students with access to universal-free school breakfast than among students in SBP schools. As alluded to in the introduction to this section, however, this finding does not necessarily imply that students who are offered school breakfast free of charge are overeating. Some children may overeat while others rely on school breakfast to supplement what they eat or drink at home in the morning because it is not enough.

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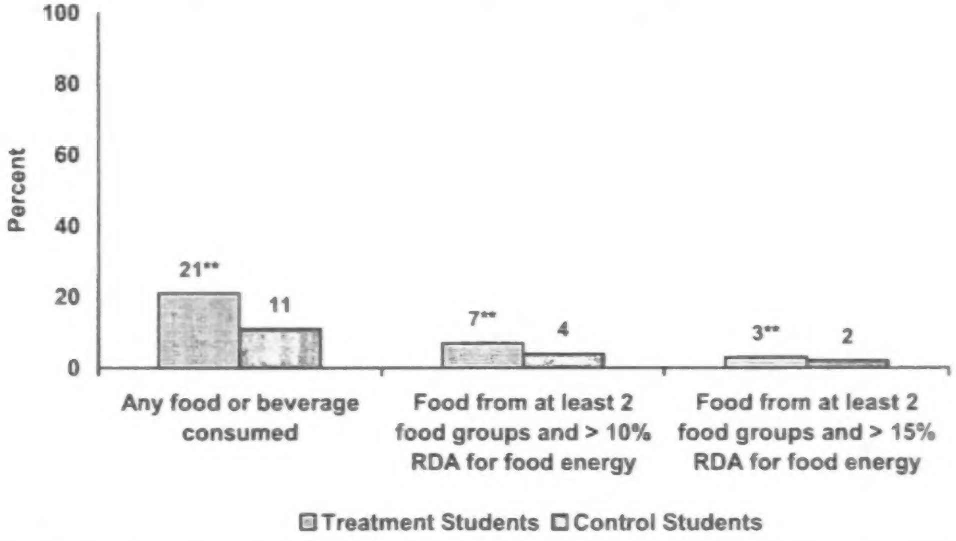
[12] A small number of students (N=10) consumed three substantive breakfasts on the target day.

To help determine whether the availability of a free breakfast at school had any effect on the likelihood that children would overeat, the more robust definitions of breakfast were used to identify students eating more than one breakfast. When breakfast was defined using definitions 2 or 3, the difference between students in treatment and control schools remained statistically significant, but the percent of students eating more than one breakfast declined substantially. The net difference in the prevalence of eating two or more nutritionally substantive breakfasts was small, 1 to 3 percentage points overall.

Results of the analysis of impacts by school meal eligibility status are shown in Appendix G, Exhibit G-2. There was a significantly larger treatment-control difference in the proportion of students eating any breakfast from more than one source among paid-eligible students relative to free/reduced-price eligible students (13 percent versus 7 percent, respectively, p<.01). This may reflect the larger gains in school breakfast participation enjoyed by students with paid eligibility, as discussed previously in this report. (More paid-eligible students relative to free/reduced-price eligible students may have had breakfast at home in addition to breakfast at school when it was offered free.) When breakfast was defined more substantively, the differences in impacts between the eligibility groups were much smaller, but remained statistically significant for definition 2 (p<.05). Again, the proportions of students eating more than one breakfast in these subgroups was quite small (2 to 8 percent overall).

Exhibit 5.8

Percent of Students Eating More than One Breakfast, by Breakfast Definition[1]



N=4,278

[1] Percentages include only those students for whom one source of breakfast food was the school breakfast.

** Difference is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Impacts on the likelihood of eating any breakfast at home and at school were also significantly greater among white versus non-white students (12 percent versus 8 percent, p<.01) (Exhibit G-4).

Students eating more than one substantive breakfast based on breakfast definitions 2 and 3 were receiving, on average, 40 to 41 percent of their daily energy requirement at breakfast (Exhibit 5.9). Since there are no reference standards for comparison, it is not possible to say what an appropriate proportion of daily intake from breakfast should be. Nevertheless, national survey data show that breakfast typically contributes 20 percent of total energy intake for children 6 to 11 years of age (USDA/ARS, 1999). Therefore, students who ate more than one substantive breakfast in this study were likely consuming more than the average amount of food energy at breakfast. They also had a significantly higher average food energy intake at breakfast and over the whole day than students who did not eat more than one breakfast. This finding was the same for students in treatment and control schools.

Exhibit 5.9

Mean Food Energy Intake at Breakfast and Over 24 Hours Among Students Who Consumed More Than One Substantive Breakfast[1]

	Treatment Schools		Control Schools	
	N	Mean	N	Mean
	Percent of RDA for Food Energy			
Breakfast				
Students who consumed more than one breakfast	154	40.68**	79	39.83**
Students who did not consume more than one breakfast	2,058	19.46	1,987	19.81
24 Hours[2]				
Students who consumed more than one breakfast	98	118.29**	55	128.16**
Students who did not consume more than one breakfast	1,333	99.48	1,394	101.83

[1] Based on consuming food from at least two major food groups and more than 10 percent of the RDA for food energy (definition 2).

[2] Sample includes only those students for whom 24-hour intake data was available for the target day (N=2,880).

** Difference between more than one substantive breakfast and only one substantive breakfast is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Impacts on Dietary Intake

As noted in Chapter One, a consistent finding of prior studies is that eating breakfast is positively related to children's intake of food energy and key vitamins and minerals over 24 hours. Daily intakes of other dietary components like sodium and cholesterol may be higher among those who eat breakfast than among breakfast skippers. Results for fat and saturated fat have been mixed. Research focusing specifically on the effects of participation in the SBP has shown that students consuming school breakfasts have higher intakes of food energy, protein, several vitamins and minerals, and dietary fiber at breakfast than nonparticipants (Devaney et al., 1995; Devaney and Fraker, 1989;

Gleason and Suitor, 2001). Based on a recent study, differences in food energy, vitamin C, calcium, and phosphorous persist when intakes are measured over 24 hours (Gleason and Suitor, 2001). SBP participants may also have higher breakfast intakes of sodium and saturated fat as a percentage of food energy and lower intakes of carbohydrate as a proportion of food energy, especially from added sugars (Devaney et al., 1995; Gleason and Suitor, 2001). These differences, however, tend to disappear over 24 hours.

The recent study of the dietary effects of the SBP also compared the percentages of SBP participants and nonparticipants whose daily intakes met dietary standards and recommendations (Gleason and Suitor, 2001). The only dietary components for which differences were found were: vitamin C, vitamin B12, thiamin, and calcium. SBP participants had higher intakes of these micronutrients compared to nonparticipants, although almost all students had adequate intakes of vitamin B12 and thiamin. Differences in vitamin C and calcium were attributed to higher intakes of fruit and low-fat milk among SBP participants.

The availability of universal-free school breakfast had the potential to affect students' dietary intake in at least three ways: (1) food and nutrient intake at breakfast and over 24 hours (both on a given day and usual intake); (2) the degree to which dietary recommendations and standards are met; and (3) the extent of waste of school breakfast foods and associated nutrients. Based on lessons learned from prior research, the expected direction of effects of universal-free school breakfast would be an increase in students' food and nutrient intake at breakfast and possibly over 24 hours. If the difference in usual nutrient intake between students with access to free breakfasts relative to those in control schools was large enough, it might also increase the proportion of students meeting dietary recommendations and standards (and reduce the proportion with nutritionally inadequate diets).

A possible negative effect of universal-free school breakfast could result if the associated increase in dietary intake led to total intakes of food energy in excess of energy expenditure. This might happen if students whose energy intake is already adequate simply add a school breakfast to what they normally eat, increasing energy intake both at breakfast and over 24 hours. Over time, this behavior could contribute to problems of overweight and obesity. Another possible negative effect of providing breakfasts free of charge is that students would be more likely to waste items from the school breakfast. This could occur if students who had already eaten breakfast at home selected a school breakfast but did not eat all of it, either because they were not hungry enough or because the quality of the breakfasts declined in some way as a result of the implementation of the program.

The analyses reported in this section focus on students' food and nutrient intake, both at breakfast and over 24 hours. The goals were, first, to determine whether students with access to universal-free school breakfasts are more likely to consume a nutritious breakfast than their SBP counterparts, and second, what effect these breakfasts have on the nutritional quality of their total diet. Although not strictly an experimental issue, a secondary question of interest is how the availability of free school breakfasts affects the degree of food waste and, as a result, nutrient waste by students selecting a school breakfast.

Measures and Analytic Variables

The primary measures used in the analyses of students' dietary intake included:

- Food energy and nutrient intake at breakfast;

- Food energy and nutrient intake over 24 hours;
- Contribution of breakfast to food energy and nutrient intake over 24 hours;
- Proportion of students meeting dietary standards and recommendations;
- Food group intake at breakfast; and
- Food group intake over 24 hours.

The data used to construct measures of food and nutrient intake at breakfast were derived from a dietary recall interview with the student at school, as described above. Measures of intake for the full day were based on the combination of data from the breakfast recall with data from a parent-assisted dietary recall interview conducted the following day or within 48 hours of the breakfast recall.[13] This part of the interview took place at the school or at the student's home. The interview period covered all foods and beverages the students consumed from midnight to midnight on the day breakfast recalls were conducted.[14] Parents were asked to complete and bring to the interview a nonquantitative food record to aid in recalling their child's food and beverage intake during that period. A second dietary recall was conducted with a subsample of the students using the same methodology. These data were used to estimate the distribution of students' usual food energy and nutrient intake, a prerequisite to determining nutrient adequacy and conformity with dietary recommendations.

Food energy and nutrient content were calculated for all foods and beverages considered to be part of breakfast and for the whole day using the Nutrition Data System for Research (NDS-R). (This was the same food and nutrient database used to analyze SBPP breakfast menus as reported in Chapter Three.) Vitamin and mineral intakes were measured as percentages of the latest available Recommended Dietary Allowances (RDAs)[15] (Institute of Medicine (IOM), 2001, 2000b, 1998, and 1997; National Research Council (NRC), 1989a). The macronutrients total fat, saturated fat, carbohydrate, and protein were calculated as a percentage of total food energy. Variables for sodium, cholesterol, and dietary fiber were expressed in units representing the absolute amount of the dietary component. Fiber intake was also measured as a percentage of the American Health Foundation's recommendation for children of "age-plus-five" grams per day (Williams, 1995). Food intake was measured as the number of servings of each of the five major food groups of the USDA Food Guide Pyramid as well as 22 subgroups (USDA/ARS, 2000). Intake of discretionary fat, in grams, and teaspoons of added sugars were also measured.[16] Food group servings were derived from the USDA Pyramid servings database after linking foods and ingredients coded in the NDS-R database to USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes of Individuals (CSFII). Appendix E provides more information on this methodology.

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[13] The exception was interviews conducted after the 48-hour window for the parent-assisted part of the dietary recall (N=467, or 14 percent). "Late recalls" included all foods and beverages the student consumed the day immediately preceding the interview; the first breakfast recall with the student was not included in the estimates of 24-hour intake for these students.

[14] Information was also collected about dietary supplement intake but is not included in the nutrient analyses reported here. Overall, 18 percent of students were taking vitamins, minerals, or some other type of dietary supplement. Supplement use was equally distributed among students in treatment and control schools.

[15] The RDA is an average intake level sufficient to meet the nutrient requirements of nearly all (97 to 98 percent) healthy individuals in a particular age and gender group. In the case of calcium, where scientific evidence was not sufficient for determining a new RDA, two variables were constructed: (1) calcium as a percentage of the 1989 RDA and (2) calcium as a percentage of the DRI-based Adequate Intake (AI) value. The AI is a recommended intake value based on observed or experimentally determined estimates of nutrient intake by groups of healthy people that are assumed to be adequate (IOM, 2000a).

In order to assess and compare the nutrient adequacy of students' diets, it was necessary to estimate usual intake distributions. Because day-to-day variability in intakes can be great, statistical adjustments must be made to partially remove this variability and better reflect the individual-to-individual variation of intakes for each dietary component of interest. Data from the second dietary recalls, available for a random subsample of 12 percent of the student sample, were used to adjust the intake distributions. The methods developed by Nusser and colleagues (1996) were employed, both to estimate the usual 24-hour intake distribution of students and to generate estimates of the proportion of students whose usual intake was above or below dietary reference standard values and national dietary recommendations. The procedure was carried out using the Software for Intake Distribution Estimation (C-SIDE).[17] Usual intake distributions and the percentile values of the usual distribution were calculated for food energy and nutrients.[18] Where possible, the proportion of students whose usual intake equaled or exceeded the Estimated Average Requirement (EAR) was estimated to assess adequacy of nutrient intake. To assess the percentages of students whose macronutrient intake was consistent with dietary recommendations, usual intake was compared with quantitative recommendations from the 2000 *Dietary Guidelines for Americans* (USDHHS and USDA, 2000) and the National Research Council's (NRC) *Diet and Health* report, as well as the "age-plus-five" grams recommendation for fiber. Further discussion of estimates of usual intake and values for the specific reference standards and dietary recommendations used in this analysis are provided in Appendix E.

The determination of waste was based on students' self-report of the types and amounts of school breakfast food items they were served (or self-selected) and the proportion of each item actually consumed. Actual school breakfast trays or brown-bag breakfasts and a menu list with portion size information obtained from the school cafeteria manager were used to enhance the accuracy of data on amounts served. The mean amounts of food and nutrients wasted were calculated as a percent of the total amount of school breakfast food and nutrients served/selected for each student. The percent of food wasted was calculated for all types of foods combined and separately for six food groups: milk; fruits, juice, and vegetables; meat and meat alternates; grains and breads; combination entrees (e.g., breakfast sandwiches); and all other (non-creditable) foods and beverages.

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[16] Discretionary fat and added sugars (along with alcohol) are components of the Pyramid tip. Discretionary fat includes all "excess" fat from the five major food groups beyond amounts that would be consumed if only the lowest fat forms were eaten, as well as fats added to foods in preparation or at the table (e.g., butter, oil, cream cheese). Added sugars include all forms of sugar used as ingredients in processed and prepared foods (e.g., cakes, soft drinks, jam, ice cream) and sugars added to foods at the table (USDA/ARS, 2000).

[17] Version 1.0, developed by Iowa State University, 1996.

[18] It was not possible to estimate the distribution of usual *food* intake using C-SIDE because the distribution of food intake tends to be highly skewed with a large proportion of zero values.

Findings

The sections that follow report results of analyses of the impact of universal-free school breakfast on students' food and nutrient intake, both at breakfast and over 24 hours. Impacts on the likelihood that students' usual diet is adequate and meets dietary recommendations for health promotion are also included. The section concludes with a discussion of the effects of offering breakfast free of charge on the amount of food and nutrients wasted in school breakfasts.

Food and Nutrient Intake at Breakfast

The analyses of students' dietary intake suggest that the availability of universal-free school breakfast is associated with a few small differences in students' nutrient and food group intake at breakfast.

For all students, breakfast provided approximately 21 percent of the 1989 RDA for food energy, from one third to over 100 percent of the RDA for protein and key vitamins and minerals, and almost 18 percent of the recommended intake of dietary fiber (based on age-plus-five grams). Although meal-specific dietary recommendations are not available, students' breakfast intakes of total fat, saturated fat, carbohydrate, cholesterol, and sodium were not detracting from meeting recommendations for the full day.

Breakfast made little to no contribution to the recommended daily intake of foods from the vegetable or meat and meat substitutes groups (Appendix E, Exhibit E-2) for treatment or control school students. On average, breakfast provided slightly less than one third of the minimum recommended number of Food Guide Pyramid daily servings of grain products and about one half of the minimum recommendations for dairy products and fruits (Kennedy et al., 1995).[19] The mean breakfast intake of added sugar ranged from 42 to 83 percent of the guideline for total added sugar per day for individuals seven years and older with energy requirements of 2,200 and 1,600 calories, respectively (USDA/ARS, 2000). Discretionary fat made up from 12 to 17 percent of the guideline for total fat intake at those calorie levels.

Mean Food Energy and Nutrient Intake. Results of the analysis of students' intake of food energy, nutrients, and other dietary components at breakfast are shown in Exhibit 5.10.[20] Mean intakes were very similar for students in schools operating universal-free school breakfast compared with those with access to the SBP. Statistically significant differences in breakfast nutrient intake were a 2 percentage point higher average percentage RDA and Adequate Intake, or AI, for calcium and phosphorous, and a 10 mg lower dietary cholesterol intake among students in treatment schools compared with those in control schools.

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[19] Food Guide Pyramid servings recommendations depend on age and gender, and there are no specific guidelines for the number of servings to consume at breakfast.

[20] The mean breakfast intakes reported here are based on the full sample of students for whom breakfast intake data were collected (N=4,278). Except for the macronutrients measured as a percentage of food energy, the means include students who skipped breakfast (N=150). Note that findings are the same when breakfast skippers are excluded.

Exhibit 5.10

Mean Food Energy and Nutrient Intake at Breakfast

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as % 1989 RDA)	20.94 (0.28)	20.58 (0.28)	0.43	0.03
Protein (as % 1989 RDA)	42.79 (0.64)	41.98 (0.69)	1.07	0.03
Percent of Food Energy from:				
Total fat	23.53 (0.26)	23.71 (0.29)	-0.36	-0.03
Saturated fat	9.42 (0.12)	9.43 (0.13)	-0.10	-0.02
Carbohydrate	65.90 (0.31)	66.20 (0.36)	-0.12	-0.01
Protein	12.31 (0.10)	12.02 (0.11)	0.31	0.06
Vitamins (as percent of RDA)[1]				
Vitamin A	62.12 (1.17)	60.42 (1.17)	2.84	0.05
Vitamin C	85.48 (2.36)	86.24 (2.64)	0.47	0.00
Vitamin B_6	78.02 (1.63)	79.25 (1.74)	0.24	0.00
Vitamin B_{12}	95.90 (2.17)	97.94 (2.45)	-0.68	-0.01
Niacin	59.57 (1.18)	60.21 (1.25)	0.20	0.00
Thiamin	78.00 (1.29)	78.29 (1.40)	0.63	0.01
Riboflavin	110.00 (1.79)	109.63 (1.92)	1.73	0.02
Folate	50.94 (0.91)	51.05 (0.98)	0.60	0.01
Minerals (as percent of RDA)[1]				
Calcium	37.73 (0.61)	35.75 (0.62)	2.39*	0.08
Calcium (as percent of AI)	35.83 (0.58)	33.95 (0.59)	2.30*	0.08
Iron	63.17 (1.24)	63.56 (1.35)	0.07	0.00
Magnesium	32.16 (0.56)	31.41 (0.57)	1.18	0.04
Phosphorous	38.60 (0.73)	36.99 (0.75)	2.07*	0.06
Zinc	51.82 (1.11)	51.64 (1.23)	0.84	0.02
Other Dietary Components				
Cholesterol (mg)	40.77 (1.78)	50.39 (2.45)	-9.90**	-0.10
Sodium (mg)	543.66 (8.53)	550.54 (10.39)	-8.00	-0.02
Fiber (gm)	2.51 (0.05)	2.49 (0.05)	0.04	0.02
Fiber (as percent of age-plus-5 gm)	17.68 (0.36)	17.56 (0.37)	0.31	0.02
Number of Students[2]	2,212	2,066		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented both as a percent of the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

While the direction of differences in calcium, phosphorous, and cholesterol intake suggest a positive impact of universal-free school breakfast on students' nutrient intake, they may or may not be nutritionally important.[21]

The effects of the availability of universal-free school breakfast on nutrient intake at breakfast were also compared among students eligible for free or reduced-price and paid school meals (Exhibit G-2). Statistically significant differences in impacts favoring free/reduced-price eligible students were found for three dietary components, percent of food energy from total fat and carbohydrate, and sodium ($p<.01$ for fat and sodium, $p<.05$ for carbohydrate). These differences were small, less than 2 percent of total food energy from fat and carbohydrate and 39 mg of sodium.

There were no clear patterns of results suggesting different effects of the availability of universal-free school breakfast based on students' minority status, gender, or grade (Exhibits G-8 and G-11).

Mean Food Group Intake. The availability of universal-free school breakfast had little effect on students' intake of foods from the Food Guide Pyramid food groups at breakfast. Results for the five major food groups and all subgroups are shown in Exhibit 5.11. Statistically significant differences were found in the mean numbers of servings of fruits, dairy products, and meat and meat substitutes[22] (red meat and eggs, in particular) consumed by students in treatment schools compared with their controls. The differences were all extremely small in magnitude (one tenth of a serving or less).

Findings from the analyses of food group intake at breakfast by school meal eligibility status, minority status, gender, and grade provided little evidence of differential impacts of the availability of universal-free school breakfast (Exhibits G-2, G-4 and G-11).

An additional analysis was conducted to determine the percent of fluid milk consumed at breakfast that was skim or one percent lowfat. For treatment school students, this was 51.1 percent and for control students, 43.1 percent.

Food and Nutrient Intake Over 24 Hours

Given limited evidence that the availability of universal-free school breakfast led to the consumption of more nutritious breakfasts, there was little reason to expect students' overall diets to improve as a result of the intervention. Results of analyses of students' dietary intake over 24 hours confirm this.

Of note is the somewhat higher mean food energy (as a percent of the 1989 RDA) intake over 24 hours for the SBPP student sample compared with national estimates. Based on the 1994-96, 1998 CSFII, mean food energy intake for males 6 to 11 years old is 101 percent of RDA, but for females of the same age is only 91 percent of the RDA (USDA/ARS, 1999); means for the SBPP sample overall

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[21] The relevant measure for deciding whether or not an impact on food and nutrient intake is nutritionally important is the impact on those students who participated in school breakfast. These analyses are reported in Appendix F of this report.

[22] The Pyramid Servings database uses one ounce of lean meat or the equivalent as the serving size for the meat and meat substitutes group. The number of servings of meat/meat substitutes in this report is based on 2.5 ounces per serving, the serving size used in the Healthy Eating Index (Kennedy et al., 1995).

Exhibit 5.11

Mean Food Group Intake at Breakfast

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
	Number of Servings[1]			
Grain Products	**1.8 (0.03)**	**1.7 (0.03)**	**0.1**	**0.05**
Whole grains	0.5 (0.02)	0.5 (0.02)	0.0	0.01
Non-whole grains	1.3 (0.03)	1.2 (0.03)	0.1	0.05
Vegetables	**0.0 (0.00)**	**0.0 (0.01)**	**0.0**	**-0.05**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.04
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.02
White potatoes	0.0 (0.00)	0.0 (0.01)	0.0	-0.05
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.03
Tomatoes	0.0 (0.00)	0.0 (0.00)	0.0	0.06
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	0.0	0.00
Other vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.03
Fruits	**0.6 (0.02)**	**0.5 (0.02)**	**0.1** **	**0.09**
Citrus fruits, melons, and berries	0.3 (0.01)	0.3 (0.01)	0.0	0.02
Other fruits	0.3 (0.01)	0.2 (0.01)	0.1**	0.10
Dairy Products	**0.8 (0.02)**	**0.8 (0.02)**	**0.1** *	**0.08**
Milk	0.8 (0.01)	0.7 (0.02)	0.0	0.05
Yogurt	0.0 (0.00)	0.0 (0.00)	0.0	0.13
Cheese	0.0 (0.00)	0.0 (0.00)	0.0	0.06
Meat and Meat Substitutes	**0.1 (0.01)**	**0.1 (0.01)**	**0.0** *	**-0.08**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.00)	0.0*	-0.07
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.0 (0.00)	0.0 (0.00)	0.0	0.03
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.00)	0.0	-0.04
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	0.0	0.02
Eggs	0.0 (0.00)	0.1 (0.00)	0.0**	-0.11
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.05
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	0.00
Discretionary fat (gm)	9.3 (0.19)	9.4 (0.20)	-0.1	-0.01
Added sugars (tsp)	5.2 (0.11)	5.3 (0.12)	-0.1	-0.02
Number of Students[3]	2,212	2,066		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

- * Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

(students 7 to 13 years of age) were 106 percent of the RDA for males and 97 percent for females.[23] Intakes of most vitamins and minerals also exceeded the national averages, but macronutrients as a percentage of food energy were quite similar.

Overall, students' 24-hour intake of grain and dairy products fell within the age- and gender-specific recommended number of servings per day from the Food Guide Pyramid (Exhibit E-2). For all other major food groups, intakes fell short of recommendations. Students' mean intake of added sugars was double the guideline for total added sugar for individuals with energy requirements of 2,200 calories per day. Discretionary fat intake ranged from 82 to 113 percent of the guideline for total fat intake, depending on energy requirements.

Mean Food Energy and Nutrient Intake. Exhibit 5.12 shows that there was essentially no effect of the availability of universal-free school breakfast on students' nutrient intake over 24 hours.[24] The one dietary component for which there was a statistically significant difference was cholesterol. Students in treatment schools were consuming, on average, 12 mg less cholesterol per day than students in control schools. The meaning of this finding is unclear, however, given that cholesterol intakes for students in both treatment and control schools were well below the recommended maximum of 300 mg of cholesterol per day (NRC, 1989b).

Despite concerns to the contrary, the availability of universal-free school breakfast did not affect group mean food energy intake. Average food energy intake over 24 hours did not differ significantly between treatment and control school students.

There were few significant differences in the impact of universal-free school breakfast on nutrient intake over 24 hours by school meal eligibility status (Exhibit G-2). Impacts on 24-hour intake of vitamins A and B_6 were positive for free/reduced-price eligible students and negative for students with paid eligibility ($p<.05$). No other differences in the effects of universal-free school breakfast on 24-hour nutrient intake emerged from the other subgroup analyses.

Mean Food Group Intake. There was no discernable effect of the availability of universal-free school breakfast on students' food group intake over 24 hours (Exhibit 5.13). As was the case with breakfast, the only statistically significant differences between treatment and control school students were of the magnitude of one tenth of a serving or less. The percent of total fluid milk consumed that was skim or one percent lowfat was 57.2 for treatment students and 54.0 percent for controls.

Results of the analysis of 24-hour food group intake by school meal eligibility, minority status, gender, and grade suggest little to no substantive differences in impacts associated with the availability of universal-free school breakfast (Exhibits G-2 and G-4).

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[23] The 1989 RDA for food energy is 2,000 calories per day for children 7 to 10 years of age, 2,200 calories for females 11 to 14, and 2,500 calories for males 11 to 14.

[24] The mean intakes over 24 hours reported in this section include all students for whom intake data from both the breakfast and parent-assisted components of the recall interview were available (N=3,347). This includes interviews that combined these components because they were conducted "late" (N=467).

Exhibit 5.12

Mean Food Energy and Nutrient Intake Over 24 Hours

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as % of 1989 RDA)	100.26 (0.71)	101.94 (0.74)	-1.60	-0.05
Protein (as % of 1989 RDA)	241.55 (2.22)	247.77 (2.39)	-5.70	-0.06
Percent of Food Energy from:				
Total fat	31.64 (0.16)	32.03 (0.16)	-0.45	-0.07
Saturated fat	11.73 (0.08)	11.95 (0.08)	-0.24	-0.07
Carbohydrate	55.35 (0.19)	54.97 (0.19)	0.45	0.06
Protein	14.44 (0.09)	14.45 (0.09)	-0.01	0.00
Vitamins (as percent of RDA)[1]				
Vitamin A	164.94 (2.34)	164.29 (2.43)	2.14	0.02
Vitamin C	254.44 (5.25)	259.46 (5.27)	-3.90	-0.02
Vitamin B_6	218.58 (2.99)	221.37 (2.84)	-0.85	-0.01
Vitamin B_{12}	296.95 (4.22)	311.57 (6.44)	-12.00	-0.05
Niacin	208.43 (2.40)	210.68 (2.33)	-1.10	-0.01
Thiamin	243.42 (2.57)	244.95 (2.59)	-0.20	0.00
Riboflavin	309.92 (3.26)	311.58 (3.34)	0.32	0.00
Folate	150.09 (1.83)	149.56 (1.75)	1.51	0.02
Minerals (as percent of RDA)[1]				
Calcium	134.22 (1.52)	135.65 (1.61)	-0.31	0.00
Calcium (as percent of AI)	127.53 (1.46)	128.78 (1.54)	-0.17	0.00
Iron	180.61 (2.02)	182.38 (2.26)	-0.68	-0.01
Magnesium	134.70 (1.58)	135.85 (1.52)	-0.39	-0.01
Phosphorous	161.54 (2.34)	162.21 (2.35)	-0.01	0.00
Zinc	171.10 (2.11)	173.72 (2.16)	-1.60	-0.02
Other Dietary Components				
Cholesterol (mg)	202.34 (3.37)	214.32 (4.01)	-12.00*	-0.08
Sodium (mg)	3237.50 (28.94)	3283.14 (31.46)	-43.00	-0.03
Fiber (gm)	14.06 (0.15)	14.24 (0.16)	-0.13	-0.02
Fiber (as percent of age-plus-5 gm)	99.26 (1.08)	100.41 (1.11)	-0.76	-0.02
Number of Students[2]	1,699	1,648		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented both as a percent of the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

- Difference is statistically significant at the .05 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Exhibit 5.13

Mean Food Group Intake Over 24 Hours

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
		Number of Servings[1]		
Grain Products	**7.5** (0.08)	**7.7** (0.09)	**-0.1**	**-0.03**
Whole grains	1.1 (0.03)	1.1 (0.03)	0.0	0.02
Non-whole grains	6.4 (0.07)	6.5 (0.08)	-0.1	-0.04
Vegetables	**2.1** (0.04)	**2.2** (0.04)	**-0.1**	**-0.05**
Dark green vegetables	0.1 (0.01)	0.1 (0.01)	0.0	-0.03
Deep yellow vegetables	0.1 (0.01)	0.1 (0.01)	0.0	-0.02
White potatoes	0.8 (0.03)	1.0 (0.03)	-0.1*	-0.09
Other starchy vegetables	0.2 (0.01)	0.1 (0.01)	0.0	0.03
Tomatoes	0.4 (0.01)	0.4 (0.01)	0.0	0.05
Cooked dry beans and peas	0.1 (0.01)	0.1 (0.01)	0.0	0.00
Other vegetables	0.5 (0.02)	0.5 (0.02)	0.0	0.04
Fruits	**1.7** (0.04)	**1.7** (0.04)	**0.0**	**0.02**
Citrus fruits, melons, and berries	0.7 (0.03)	0.7 (0.03)	0.0	-0.03
Other fruits	1.0 (0.03)	1.0 (0.03)	0.1	0.06
Dairy Products	**2.7** (0.03)	**2.7** (0.04)	**0.0**	**0.00**
Milk	2.0 (0.03)	2.0 (0.03)	0.0	0.00
Yogurt	0.1 (0.01)	0.1 (0.00)	0.0	0.08
Cheese	0.6 (0.02)	0.6 (0.02)	0.0	-0.03
Meat and Meat Substitutes	**1.4** (0.02)	**1.4** (0.02)	**-0.1**	**-0.05**
Red meat (beef, pork, veal, lamb, game)	0.6 (0.02)	0.6 (0.02)	0.0	-0.04
Organ meats	0.0 (0.00)	0.0 (0.00)	0.0	-0.05
Frankfurters, sausage, luncheon meats	0.2 (0.01)	0.2 (0.01)	0.0	0.03
Poultry (chicken, turkey, other)	0.3 (0.02)	0.3 (0.01)	0.0	0.01
Fish and shellfish	0.1 (0.01)	0.1 (0.01)	0.0	-0.03
Eggs	0.1 (0.01)	0.1 (0.01)	0.0*	-0.08
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.07
Nuts and seeds	0.1 (0.00)	0.1 (0.00)	0.0	-0.04
Discretionary fat (gm)	59.2 (0.62)	60.4 (0.64)	-1.1	-0.04
Added sugars (tsp)	24.2 (0.32)	24.2 (0.32)	0.1	0.0
Number of Students[2]	1,699	1,648		

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Exhibit 5.14

Percent Contribution of Breakfast to Nutrient Intake Over 24 Hours

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy	21.58 (0.24)	20.63 (0.24)	0.97*	0.10
Macronutrients				
Protein	18.83 (0.26)	17.54 (0.26)	1.34**	0.13
Total fat	17.22 (0.30)	16.33 (0.30)	0.77	0.06
Saturated fat	18.33 (0.33)	17.44 (0.33)	0.80	0.06
Carbohydrate	24.93 (0.28)	24.14 (0.28)	0.88*	0.08
Vitamins				
Vitamin A	38.01 (0.55)	36.80 (0.55)	1.65	0.07
Vitamin C	32.46 (0.64)	31.02 (0.66)	1.71	0.07
Vitamin B_6	33.69 (0.49)	32.90 (0.50)	1.33	0.07
Vitamin B_{12}	31.26 (0.53)	30.11 (0.56)	1.38	0.06
Niacin	28.08 (0.40)	27.50 (0.41)	0.92	0.06
Thiamin	32.01 (0.37)	31.38 (0.38)	0.89	0.06
Riboflavin	34.93 (0.40)	33.83 (0.41)	1.42*	0.09
Folate	33.59 (0.43)	33.49 (0.45)	0.47	0.03
Minerals				
Calcium	29.20 (0.41)	26.94 (0.41)	2.41**	0.15
Iron	33.27 (0.43)	32.94 (0.46)	0.65	0.04
Magnesium	24.48 (0.30)	23.22 (0.31)	1.43**	0.12
Phosphorous	24.63 (0.31)	22.71 (0.32)	1.95**	0.15
Zinc	28.84 (0.44)	27.39 (0.45)	1.75*	0.10
Other Dietary Components				
Cholesterol	18.21 (0.47)	18.79 (0.51)	-0.69	-0.04
Sodium	17.96 (0.28)	17.45 (0.28)	0.48	0.04
Fiber	18.72 (0.31)	18.33 (0.33)	0.54	0.04
Number of Students[1]	1,650	1,592		

[1] Does not include students who skipped breakfast.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: *Impact Study – 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit 5.15

Percent of Students Whose Usual Daily Food Energy and Nutrient Intakes Met Standard for Dietary Adequacy[1]

	Unadjusted Percentages (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Odds Ratio**
Food Energy	92.85 (0.48)	94.29 (0.39)	-1.44	0.79
Protein	99.98 (0.00)	100.00 (0.00)	-0.02	1.00
Vitamins				
Vitamin A	99.50 (0.04)	98.56 (0.07)	0.93	1.44
Vitamin C	98.41 (0.04)	99.85 (0.01)	-1.44	0.63
Vitamin B_6	99.97 (0.00)	99.81 (0.01)	0.16	1.00
Vitamin B_{12}	99.99 (0.00)	100.00 (0.00)	-0.01	1.00
Niacin	100.00 (0.00)	100.00 (0.00)	0.00	1.00
Thiamin	100.00 (0.00)	100.00 (0.00)	0.00	1.00
Riboflavin	100.00 (0.00)	100.00 (0.00)	0.00	1.00
Folate	99.46 (0.03)	98.02 (0.04)	1.45	2.00
Minerals				
Calcium	94.20 (0.10)	98.36 (0.33)	-4.16	0.27
Iron	100.00 (0.00)	100.00 (0.00)	0.00	1.00
Magnesium	93.80 (0.07)	94.73 (0.06)	-0.93	0.84
Phosphorous	93.17 (0.06)	94.48 (0.06)	-1.31	0.80
Zinc	98.22 (0.03)	99.40 (0.02)	-1.18	0.56
Number of Students[2]	1,699	1,648		

[1] For vitamins and minerals, except calcium, the Estimated Average Requirements (EARs) based on DRIs are used as standards. There is no EAR for total food energy, protein, or calcium. For energy, protein, and calcium, 80 percent of the 1989 RDA was used as an approximation of the estimated average requirements.

[2] Includes students who skipped breakfast.

Note: Students' usual intake distribution was determined based on two days of intake data for 12 percent of the sample and one day of intake data for the remaining sample using the Software for Intake Distribution Estimation, Iowa State University, 1996.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Contribution of Breakfast to Food Energy and Nutrient Intake over 24 Hours

The percent contribution of breakfast to students' food energy and nutrient intake over 24 hours is shown in Exhibit 5.14. Among all students, breakfast contributed approximately 21 percent of total food energy, from 17 to 25 percent of the macronutrients, and 24 to 37 percent of vitamin and mineral intake for the day. These intakes were similar to but slightly higher than national estimates of the mean contribution of breakfast to daily nutrient intake (USDA/ARS, 1999).

Comparing students in treatment schools to those in control schools, the contribution of breakfast to total daily intake was significantly greater for food energy, protein, carbohydrate, riboflavin, calcium, magnesium, phosphorous, and zinc.[25] These differences were small (1 to 2 percentage points of intake over 24 hours) and tended not to vary by school meal eligibility, minority status, gender, or grade (Exhibits G-2, G-4 and G-8).

Proportion of Students Meeting Dietary Standards and Recommendations

As discussed above, another aspect of estimating effects of universal-free school breakfast on students' dietary intake was an analysis comparing students' usual nutrient intake distribution relative to the latest dietary standards and national health promotion dietary recommendations. The availability of universal-free school breakfast was not associated with a higher likelihood of meeting daily dietary requirements and other health promotion recommendations. The vast majority of students in both treatment and control schools (93 to 100 percent) were consuming a diet that provided more than 80 percent of the RDA for food energy and protein and was adequate in vitamins and minerals. Of general concern are the very low percentages of students whose diets were in line with recommendations for fat, saturated fat, and sodium. The only dietary recommendation with which most students' intakes complied was for cholesterol.

The first part of the analysis, which is summarized in Exhibit 5.15, was essentially a comparison of the proportions of students whose diets were at risk of being inadequate with respect to total food energy, protein and vitamin and mineral intake. There were no statistically significant differences between treatment and control schools in the percentage of students whose usual 24-hour food energy, protein, and vitamin and mineral intakes met or exceeded dietary standards. Since an Estimated Average Requirement (EAR) has not yet been established for food energy or protein intake, and cannot be determined for calcium (IOM, 1997), the distributions of usual intake for these components were also compared. These results are shown in Exhibit 5.16. Both the mean and 50th percentile for food energy and protein were significantly lower among treatment school students versus their controls, but these differences were small relative to usual intake values. The distributions for calcium as a percent of AI were similar for both groups of students.

The second part of the analysis compared the effects of the availability of universal-free school breakfast on students' usual intake of macronutrients and other dietary components relative to the *Dietary Guidelines* and other national recommendations. Findings are shown in Exhibit 5.17. There were no statistically significant differences between treatment and control schools in the percent of students whose usual 24-hour intake met *Dietary Guidelines* recommendations for total fat and saturated fat, NRC recommendations for cholesterol, sodium, carbohydrate and protein, or the recommended level of dietary fiber for children.

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[25] This analysis was limited to those students who had any food or beverage for breakfast (N=3,242), but results are identical when breakfast skippers are included.

Exhibit 5.16

24-Hour Usual Intake Distributions for Food Energy, Protein and Calcium

Dietary Component	Adjusted Values (Standard Errors)		
	Treatment Schools	Control Schools	Difference
Food Energy (as percent of RDA)			
Mean	101 (0.36)	103 (0.39)	-2**
Percentile:			
5th	78 (2.95)	79 (3.01)	-1
10th	83 (2.39)	84 (2.45)	-1
25th	91 (1.41)	92 (1.46)	-1
50th	100 (0.67)	102 (0.71)	-2*
75th	110 (1.67)	112 (1.73)	-2
90th	120 (3.25)	123 (3.39)	-3
95th	126 (4.35)	129 (4.56)	-3
Protein (as percent of RDA)			
Mean	242 (1.26)	248 (1.19)	-6**
Percentile:			
5th	168 (7.30)	180 (8.81)	-12
10th	183 (5.99)	193 (7.29)	-10
25th	208 (3.69)	217 (4.45)	-9
50th	238 (1.98)	245 (2.15)	-7*
75th	272 (4.70)	276 (5.40)	-4
90th	307 (9.48)	307 (10.50)	0
95th	330 (13.20)	327 (14.10)	3
Calcium (as percent of AI)			
Mean	127 (0.78)	129 (0.66)	-2
Percentile:			
5th	79 (4.62)	88 (5.72)	-3
10th	88 (3.86)	96 (4.76)	-8
25th	104 (2.44)	110 (2.92)	-6
50th	124 (1.29)	127 (1.38)	-3
75th	146 (3.02)	146 (3.58)	0
90th	169 (5.99)	164 (7.00)	5
95th	184 (8.23)	176 (9.40)	8
Number of Students[1]	1,699	1,648	

RDA = Recommended Dietary Allowance
AI = Adequate Intake

[1] Includes students who skipped breakfast.

Notes: Students' usual intake distribution was determined based on two days of intake data for 12 percent of the sample and one day of intake data for the remaining sample using the Software for Intake Distribution Estimation, Iowa State University, 1996.

Differences between means and the 5th, 50th and 95th percentile values were tested for statistical significance using a two-tailed *t*-test.

* Difference is statistically significant at the .05 level.
** Difference is statistically significant at the .01 level.

Source: *Impact Study – 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit 5.17

Percent of Students Whose Usual Daily Intake Met Dietary Recommendations

	Unadjusted Percentages (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Odds Ratio**
Percent of Food Energy:				
No more than 30 percent from total fat	11.24 (0.44)	28.37 (0.05)	-17.13	0.32
Less than 10 percent from saturated fat	0.20 (0.04)	4.32 (0.10)	-4.12	0.04
More than 55 percent from carbohydrate	52.87 (0.03)	50.10 (0.02)	2.77	1.12
No more than twice the 1989 RDA for protein	22.06 (0.28)	21.63 (2.83)	0.43	1.03
Other Dietary Components				
No more than 300 mg cholesterol	95.40 (0.08)	92.27 (0.11)	3.13	1.74
No more than 2,400 mg sodium	5.22 (0.05)	2.45 (0.05)	2.77	2.19
More than (age plus 5) gm dietary fiber	46.53 (0.02)	49.22 (0.02)	-2.69	0.90
Number of Students[1]	1,699	1,648		

RDA = Recommended Dietary Allowance

[1] Includes students who skipped breakfast.

Note: Students' usual intake distribution was determined based on two days of intake data for 12 percent of the sample and one day of intake data for the remaining sample using the Software for Intake Distribution Estimation, Iowa State University, 1996.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Because of the small number of replicate observations of dietary intake within subgroups (second 24-hour recalls), the analysis based on students' usual intake by school meal eligibility status was limited to food energy, protein, vitamins A and C, calcium, iron, and saturated fat.[26] There were no significant differences in the impact of universal-free school breakfast on the likelihood of meeting dietary standards or recommendations for these nutrients between free/reduced-price eligible students and students with paid eligibility. No other subgroup analyses were performed.

Food and Nutrients Wasted in School Breakfasts

Before turning to results for food and nutrients wasted, it is important to note that the analysis of the effect of universal-free school breakfast on these outcomes was not an experimental comparison. The (self-selected) group of students who participated in universal-free school breakfast in the treatment schools was compared with the (self-selected) group of students who participated in the SBP in the control schools. It is therefore possible that the results found are due to pre-existing differences between these two groups and not to the treatment. Given this caveat, the analyses provided no suggestion that the availability of universal-free school breakfast resulted in more wasted food or nutrients compared to the SBP. For all students combined, the percent of all school breakfast foods wasted was approximately 22 percent. The percent of nutrients wasted in school breakfasts overall was almost 20 percent for food energy, 18 to 23 percent for the macronutrients (protein, carbohydrate, fat and saturated fat), 15 to 24 percent for vitamins and minerals, and 17 to 25 percent for dietary fiber, sodium, and cholesterol.

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[26] Attempts to include total fat as a percent of food energy in the analysis were unsuccessful, because there was little correlation between observed intakes (first and second dietary recalls) among some subgroups of students.

Results of the analysis comparing food wasted in school breakfasts are summarized in Exhibit 5.18 (and Exhibit D-30). There was no increase in the mean percent of food wasted (by weight in grams) among students selecting a breakfast in schools where it was offered free of charge compared to students in schools offering the regular SBP. There was also no evidence of a greater percent of nutrients wasted by students selecting a school breakfast in universal-free versus SBP schools (Exhibit D-31). The trend seemed to be in the direction of less waste in school breakfast nutrients among treatment school students, but there were no large or statistically significant differences.

The availability of universal-free school breakfast had no differential impact on food or nutrients wasted in school breakfasts for students eligible for free/reduced-price meals compared with those eligible for paid meals, or for any of the other subgroups examined.

Impacts on Cognitive Functioning

Previous research regarding the effects of breakfast consumption or SBP participation on cognitive functioning has been inconclusive. The significant results reported in previous work suggest that breakfast programs targeted at certain subgroups may have significant effects on cognitive functioning. Simeon and Grantham-McGregor (1989) found that breakfast skipping can be detrimental to children who are or have previously been malnourished. Other studies comparing breakfast consumption to one-time breakfast omission found no difference on cognitive tasks measuring such things as speed and accuracy (Pollitt, Leibel and Greenfield, 1981; Cromer et al., 1990, Vaisman et al., 1996).

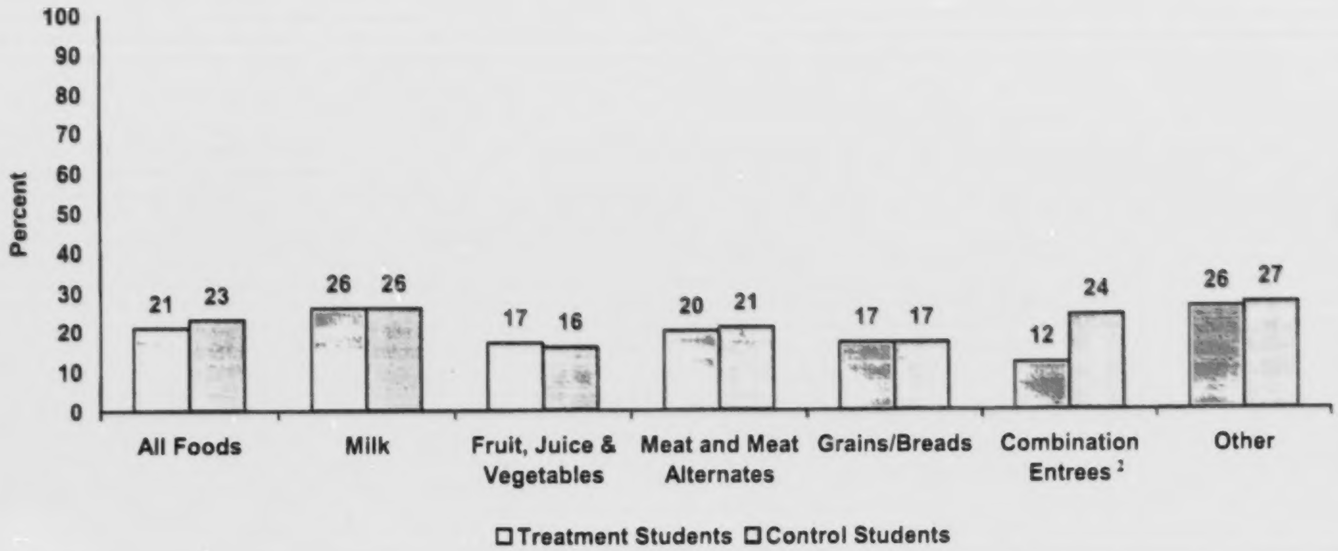
Moreover, the body of research examining the potential links between cognitive functioning and breakfast consumption suffers from a number of methodological weaknesses, including absence of random assignment, small sample size, and the use of inappropriate measures of statistical significance (Pollitt and Mathews, 1998). This lack of both consistent results and robust studies necessitates further research into the potential ties between breakfast consumption and cognitive functioning.

Measures and Analytic Variables

It was hypothesized that while breakfast consumption may have an effect on longer-term outcomes such as academic achievement, the most immediate effects of eating breakfast are likely to be seen in measures of cognitive functioning, such as attentiveness and short-term memory. Through a review of the research on breakfast consumption and cognitive functioning, a list of previously employed measures of attention and memory was established, with weight given to those measures where a statistically significant effect of a nutritional intervention had been found.

Exhibit 5.18

Percent of School Breakfast Food Wasted by Students[1]



N=1,652

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[1] Based on self-reports of amount of food served and proportion consumed. Percent food waste was calculated as amount of food wasted (gm)/amount of food served (gm) x 100.

[2] Combination entrees were selected by students in four of the six districts and included breakfast sandwiches, breakfast burritos, breakfast pizza, French toast, and sausage with pancake wraps.

Source: *Impact Study – 24-Hour Dietary Recall Interview, Spring 2001*

Based on a set of criteria that included measures appropriate for the age range of children in the sample, the existence of norms or large comparison groups, length of administration and limited use of language, three measures were selected to comprise the battery of cognitive measures: Stimulus Discrimination, Digit Span, and Verbal Fluency. Each measure and administration procedures are described below.

Stimulus Discrimination

Stimulus Discrimination (SD) (Detterman, 1988) has been used to assess the effects of breakfast on child cognitive performance in several studies (Cueto et al., 1998; Pollitt et al., 1982, 1983; Pollitt et al., 1998). The SD is appropriate for children as young as six years of age. The task is administered on a laptop computer and takes approximately 10 minutes to complete. It is appropriate for non-English speakers, as the entire task consists of attention to visual stimuli.

SD is a modified match-to-sample test. The child was presented with six empty windows in a row slightly below the center of the screen. Centered above this row of windows was a probe window. When the child pressed the space bar, the six windows each displayed a different stimulus (Exhibit 5.19). The probe window displayed a probe identical to one of the stimulus items in the row below. The child needed to find the match to the probe in the bottom row, lift his/her finger, and touch the number key corresponding to the proper match.

When the child lifted his/her finger, all windows became empty. To view the items again, s/he had to press the space bar. The child viewed the stimulus display as long as desired, but the bar had to be pressed or the display would show only empty windows.

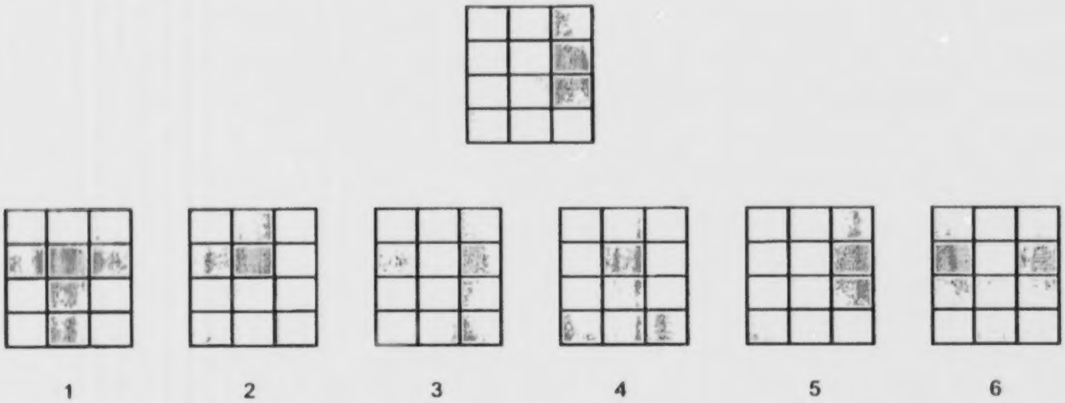
After four practice trials, the child continued with the task until he/she responded correctly to 72 trials or completed 280 trials. Thus, the pacing of the task was entirely determined by the child. If, however, the child was not close to finishing 72 correct trials after 15 minutes, the task was aborted so as to conserve time for the other components of the student interview. The variables used for analysis were as follows:

- Total Number of Trials: 72 trials plus the number of errors;
- Average Decision Time: time in seconds from first press of space bar to last space bar release; total time of viewing stimuli averaged across all trials; and
- Average Trial Time: time in seconds from first press of space bar to answer; the total viewing and response time averaged across all trials.

Digit Span

The Digit Span task is a subtest of the Wechsler Intelligence Scales for Children III (WISC-III; Wechsler, 1991). The WISC-III is a widely used standardized intelligence test with nationally representative norms. Subtests from the WISC-III are commonly used in developmental and

Exhibit 5.19
Simulation of SD Screen Display



Source: Detterman, 1988

neuropsychological research to assess child cognitive performance. It has previously been used to assess the effects of breakfast on child cognitive performance in several studies (Chandler et al., 1995; Jacoby et al., 1996; Simeon and Grantham-McGregor, 1989; Simeon, 1998). The Digit Span task is appropriate for children as young as six years of age and takes approximately five to seven minutes to administer.

The Digit Span task assesses short-term auditory memory and attentional abilities. The task normally consists of the tester orally presenting a series of numbers to the child. However, because of concerns regarding standardization of the cadence in which the digits were presented to the child and concerns about the distraction of other students being tested, a computer-administration of the Digit Span was created for this evaluation. Through headphones, the child heard a recorded series of digits played by the computer. The child then repeated the series back to the tester, forwards in the first part of the task and backwards in the second part of the task.

On Digit Span Forwards, there are eight items, each with two trials of number series equal in length. For example, the first item had two trials of a two-number series, and the second item had two trials of a three-number series. The items increased in length until the child gave incorrect responses on both trials of any item or until the child reached the last trial which is nine numbers on Digit Span Forwards and eight numbers on Digit Span Backwards. A total raw score of between 0 and 30 was possible on the Digit Span Task (Forwards + Backwards). This total raw score was then converted to a scaled score based on the child's age in years and months, to be used in further analysis.

Verbal Fluency

Verbal Fluency tasks are widely used to evaluate neuropsychological functioning in the areas of long-term verbal memory and retrieval and have been used in a number of studies of the effects of breakfast consumption on cognitive functioning (Chandler et al., 1995; Simeon and Grantham-

McGregor, 1989; Simeon, 1998). The verbal fluency task was considered age-appropriate for the children in the sample and takes approximately three minutes to administer.

Two scored trials of Verbal Fluency were administered following a practice trial insuring that the child understood the task. The child was asked to name as many items as possible in two semantic categories ("animals" and "things to eat") in a period of 60 seconds each. The examiner recorded all of the child's answers, and the score equaled the total number of correct responses for each trial. As noise was also a concern for administration of Verbal Fluency, the headphones were worn during the task. Scores for both the Animals and Things to Eat trials were used for analysis as well as a total of the two scores.

Findings

There was no discernable effect of universal-free school breakfast on the cognitive functioning measures. For the SD task, none of the outcomes showed significant differences between treatment and control school students. The overall total number of trials was 73.1 for the treatment and 73 for the controls. The overall mean decision time (i.e., the total viewing time) was 3.9 seconds for both treatment and controls. The overall mean trial time (i.e., the total of viewing time and response time) was 4.4 seconds for treatment and 4.5 for control students.

No significant differences were found on the Digit Span scaled scores either. Mean scaled scores were 9.3 for both treatment and control students. Where the SBPP sample could be compared to a norming group (only for children aged 10-11), the norming group yielded a higher overall digit span score (Wechsler, 1991). The differences in overall mean scores for Verbal Fluency were also not significant. This was the case for Animals (15.5 for treatment, 15.6 for control) and Things to Eat (14.5 for treatment and 14.4 for control) separately as well as for the combined score (30 for both treatment and control). The subgroup analyses revealed one difference on the cognitive functioning measures. Specifically, there was a very small but statistically significant difference between younger and older children on the Verbal Fluency Things to Eat score. Students in grades four and five performed slightly better than those in grades two and three as a result of the availability of universal-free school breakfast ($p < .05$; Exhibit G-9).

In summary, the results for cognitive functioning did not reveal any impact of the availability of universal breakfast in this study. Despite the various dimensions of cognitive functioning tapped by the three different measures, treatment and control school performance was essentially comparable. Given that less than 4 percent of treatment and control students skip breakfast, these findings are not surprising.

Impacts on Social/Emotional Functioning

If children are not getting an adequate breakfast before their school day, there is concern that they will have more difficulty effectively regulating their emotions and engaging in social interactions with others. Through increased participation, one potential outcome of the SBPP might be comparatively better indicators of social/emotional or psychosocial functioning for treatment than control students.

Briefel et al. (1999) report that during the mid-1990s researchers who included measures of "mood" in their studies of breakfast did find improvements related to breakfast consumption. Murphy et al.

(2001) have explored these findings further, using other measures of social/emotional functioning, and the Pediatric Symptom Checklist (PSC), in particular. In a study of the first year of the Abell program in Baltimore, they found that increased participation in school breakfast was associated with gains in emotional adjustment (Murphy et al., 2001). In Boston, researchers found that increased participation in school breakfast was associated with fewer emotional and behavioral problems (Murphy et al., 2000).

Measures and Analytic Variables

In this study, social and emotional functioning was assessed through the Pediatric Symptom Checklist (Murphy et al., 1998a) included in the Parent Survey.

The PSC was developed for pediatricians to use as a screening tool for psychosocial problems. The version of the PSC used in this study is a 17-item questionnaire covering a broad range of children's social and emotional functioning, with the parent as the intended respondent (Gardner et al., 1999). The items are rated as "never," "sometimes," or "often" and are scored 0, 1, or 2, respectively. Item scores are summed and the total score is recoded as a dichotomous variable. A score of 15 or higher is considered positive for psychosocial impairment. A score below 15 is negative. Examples of items include: "Feels sad, unhappy;" "Acts as if driven by a motor;" "Teases others;" and "Does not understand other people's feelings." Researchers indicate that nationally the prevalence of scores of 15 or higher is about 12 percent for middle class or "general" settings (http://psc.partners.org/psc_basic.htm). The mean of the 17-item questionnaire is about 8 (communication with Michael Murphy).

Analyses of the PSC for this evaluation included a comparison of treatment and control students on total scores and on percent of students considered psychosocially impaired.

Findings

There was no impact of universal-free school breakfast on psychosocial functioning as measured by the PSC in this study. The overall mean PSC score total was 10 for treatment students and 9.8 for control students. This difference was not significant.

The overall mean for students categorized as psychosocially impaired was 19.8 percent for treatment students compared with 18.6 for control students. Again, this difference was not significant. When the analyses included subgroups, there were again no overall differences for either mean score or percent impaired.

Impacts on Student Behavior

Another student outcome that universal-free school breakfast could potentially affect is student behavior in school. Children that are adequately nourished and ready to learn might be expected to be cooperative, attentive, and able to complete tasks, and to exhibit more control over their impulses. In addition to focusing on the possible cognitive benefits of breakfast consumption, previous studies of school breakfast have often included assessments of student behavior. A number of studies conducted by Murphy and his colleagues have found associations between regular participation in school breakfast programs and improved student behavior and perceptions of student behavior (see Murphy et al., 1998a, Murphy et al., 1998b, Murphy et al., 2000a, Murphy and Pagano, 2001).

Teacher Ratings

Measures and Analytic Variables

In order to evaluate student behavior, two measures of teachers' perceptions of student behavior, the Conners' Teacher Rating Scale-Revised (short form: CTRS-R(s)) and a survey of Effortful Control, were employed. Each of these measures is described briefly below.

The teacher ratings and questions were gathered through a self-administered questionnaire on each of the students in the Impact Study Sample.

Conners' Teachers Rating Scale – Revised (short form)

The CTRS-R(s) is a part of a larger set of measures, The Conners' Rating Scales, that have long been used to assess psychopathology and behavior issues, such as problems with conduct, anxiety, and social functioning, as well as attention deficit/hyperactivity disorder (ADHD) in children and adolescents (Conners, 2000). Through these measures, a child's behavior can be assessed by a parent, a teacher, or through a child self-assessment. The teacher scale was chosen for this evaluation both because it has proven to be the most economical and objective measure for assessing student academic, emotional, and social behaviors (Conners, 2000) and because teacher perception of student performance is critical in the school environment. For the purpose of this study, the short form was utilized as it was deemed sufficient for gathering information about each child's behavior while minimizing burden for teachers completing the forms. In addition, it has been determined that the short and long form yield similar results (Conners, 2000).

The CTRS-R(s) consists of 28 questions in which the teacher is to rate the child on a scale from 0 (not true at all/never or seldom) to 3 (very much true/very often or very frequent) and can be completed in an estimated 5 to 10 minutes. In scoring the CTRS-R(s), the 28 items are tallied within four constructs and are then scaled according to age and gender. They are as follows:

- **Oppositional**: Individuals scoring high on this scale are more likely to break rules and have problems with persons in authority, and are more easily annoyed and angered than most individuals their own age;

- **Cognitive Problems/Inattention**: High scorers may have more academic difficulties than most individuals their age, have problems organizing their work, have difficulty completing tasks or schoolwork, and appear to have trouble concentrating on tasks that require sustained mental effort;

- **Hyperactivity**: High scorers have difficulty sitting still, feel more restless and impulsive than most individuals their age, and have the need to always be on the go; and

- **Conners' ADHD Index**: Identifies children "at risk" for ADHD (Conners, 1997).[27]

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[27] The four subscales were tested for internal consistency using Cronbach's alpha. Each sub-scale had high coefficients of reliability, ranging from .90 to .96, signaling that the individual items in each construct fit together very well in measuring the four latent constructs.

Findings. The only significant result emerging from the CTRS-R(s) is in the oppositional subscale. The mean was 52.3 for treatment students and 51.5 for control students, which is significantly different at the .05 level. Subgroup analyses revealed significant differences on the Hyperactivity and ADHD subscales in the comparisons between white and non-white students. These comparisons showed that universal-free school breakfast was associated with slightly higher scores for whites than non-whites ($p< .05$) for both subscales (Exhibit G-6). There was also a significant interaction by district for both the hyperactivity and ADHD subscales, indicating that the direction of the scores varied by minority status in each school district.

Comparison to the norming sample for the CTRS-R showed the SBPP sample to have consistently higher scores for both boys and girls. Nevertheless, all SBPP sample scores fall within average range (45 to 55).

Effortful Control

The Effortful Control Scale used in this evaluation is comprised of a subset of questions from the Children's Behavior Questionnaire (CBQ), a highly differentiated assessment designed to measure temperament in children (Rothbart, 2002). Three subscales, attentional shifting, attentional focusing, and inhibitory control, together totaling 17 items, were recommended by Dr. Mary Rothbart as appropriate for this study because they address skills important for success at school and can be assessed by the teacher.

All items are scored on a seven-point Likert scale ranging from extremely untrue of this child (1) to extremely true of this child (7). A high score indicates good effortful control.

Although analysis began with these three constructs, testing for internal consistency revealed relatively low coefficients of reliability (.73 and .80) for two of the three subscales. The 17 items were reconfigured to create two subscales, Ability to Focus (seven items) and Ability to Follow Instructions (six items), and four items were not used for analyses. Cronbach's alpha revealed higher coefficients of reliability for these items (.88 and .84), which were then used in the analysis.

Findings. No significant differences were found between treatment and control school students on these two subscales. The overall mean score on the Focus subscale was 5.06 for treatment and 5.09 for control. The overall mean score on the Follow Instructions subscale was 5.29 for treatment and 5.30 for control schools.

When school meal eligibility status was included in the analysis, there was a significant interaction between treatment and school meal eligibility status on the Focus subscale. Overall, paid-eligible students in the treatment schools were less able to focus as a result of the availability of universal-free school breakfast ($p<.05$; Exhibit G-3).

When comparisons were made for white and non-white students, there were significant differences for the Focus and Instruction subscales. The differences were quite small but statistically significant in favor of non-white students on both subscales ($p<.05$ on each; Exhibit G-6). There was an interaction by district for each, indicating that the differences varied by site for each score ($p<.01$ for Focus, $p<.05$ for Instructions).

Disciplinary Incidents

Other sources that have previously been used to retrieve information about student behavior include interviews with principals and school staff and the records that a school keeps of disciplinary visits made to the principal's or assistant principal's office during the day. When these sources were used in evaluations of different universal-free school breakfast programs conducted by Murphy and his colleagues, the results were in favor of students in universal-free school breakfast. For example, in the Maryland Meals for Achievement evaluation, the number of suspensions fell significantly by 1.53 per month. Staff in Maryland universal-free schools perceived students to be better behaved subsequent to the implementation of the free breakfast program (Murphy and Pagano, 2001). This latter finding was similar to what was found in the evaluation of Boston's universal-free program (Murphy et al., 2000b).

Measures and Analytic Variables

Record logs for the number of disciplinary incidents were collected from each SBPP school over a 20-week period from January to May, 2001. The incidents were not the ones that teachers and school staff dealt with on their own throughout the school day, but repeated offenses or those of a more serious nature that required the principal's intervention. The principal's office provided totals of reported incidences by location (classroom, playground, hall, or bus) and time of incident (morning or afternoon). The logs document the disciplinary incidents for all students in the school, and therefore the results are presented as school-level outcomes. The mean number of daily incidents was used as the measure of comparison between treatment and control schools. The incidents were also analyzed separately for morning and afternoon, to see if there was a more immediate effect of having school breakfast.

Findings. The mean number of daily incidents was low across all schools in the districts, indicating that behavioral problems requiring the principal's intervention were relatively rare in these elementary schools. However, the results indicate a negative effect of universal-free school breakfast on disciplinary incidents. When all schools were combined, the average number of daily disciplinary visits was significantly higher for treatment than control schools (1.13 for treatment and 0.86 for controls, $p<.05$) (Exhibit D-48).

When the incidents were broken down by time of day that the incident occurred, the overall results indicate that the impact was primarily due to a difference in disciplinary incidents occurring in the morning. The treatment school mean was 0.52 compared to a control school mean of 0.39 ($p<.05$).

Impacts on Academic Achievement

One of the most visible hypothesized long-term effects of the SBPP is student performance on academic achievement tests. Given the increased attention paid to student standardized achievement test scores, it is hardly surprising that previous research has focused on establishing a link between student participation in school breakfast and student performance on academic measures. Although previous research has suggested a link between school breakfast participation and an increase in standardized test scores (Meyers et al., 1989; Wahlstrom et al., 1997), studies have in general suffered from methodological weaknesses and inconsistency of findings.

This study allows for the first serious attempt to test the hypothesis that the availability of universal-free school breakfast leads to improvement in academic test scores. The experimental design represents a major improvement over previous research in ensuring a high level of internal validity.

Measures and Analytic Variables

The school districts selected for the SBPP posed several challenges to the evaluation of achievement gains associated with universal-free school breakfast. While all of the school districts administered norm-referenced standardized tests in at least three consecutive grade levels, they were not the same tests across all districts.[28] In addition, they varied in terms of the grades that the tests are administered, and with respect to the timing of administration (fall versus spring). Exhibit 5.20 summarizes the variation in standardized achievement tests across the six school districts participating in the SBPP.

Exhibit 5.20

Standardized Achievement Tests Used in the SBPP

School District	Number of Schools	Standardized Test	Grade Levels Tested	Test Schedule
Boise	34	ITBS	3-6	Fall
Shelby	16	SAT-9	3-6	Spring
Harrison	10	CTBS	2-6	Spring
Phoenix	24	SAT-9	2-6	Spring
Santa Rosa	10	SAT-9	2-6	Spring
Wichita	59	MAT-7	3-6	Fall

ITBS:	Iowa Test of Basic Skills
SAT-9:	Stanford Achievement Test, Ninth Edition
CTBS:	Comprehensive Test of Basic Skills, Terra Nova
MAT-7:	Metropolitan Achievement Test, Seventh Edition

Traditional methods of analyzing data using different tests, grade levels, and/or timing of administration are based on equating or linking procedures.[29] The goal of these procedures is to link the various tests to the scaled score metric of the most frequently employed test. Scale score, or developmental scores, are scores that provide a common scale for different forms of a test or for different tests. True test equating is possible only for strict parallel forms of a test. Test linking, on the other hand, is a less precise activity to convert the scores on one test to the same scale as those of a second test. It is used when scores on the two tests are highly correlated and when the two tests cover the same general content domain (i.e., both are reading tests or both are math tests) but the content of the two tests are not truly parallel. Given that the tests used by the districts were not strictly parallel in content, the conversion used here constituted test linking, rather than test equating. Exhibit 5.21 summarizes various features of each of the tests utilized with respect to test content and the norming samples.

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[28] In addition to the fact that not all districts share the same common achievement test, the tests are also not given across all grade levels within a district. Thus, in terms of statistical power, the analysis of student achievement data is affected by a reduction in the number of students within each school available for analysis.

[29] Kolen and Brennan, 1995; Linn, 1993; Mislevy, 1992 for further details.

Exhibit 5.21

Norming Samples and Test Content for Standardized Achievement Tests Used in the SBPP

	SAT-9	ITBS	MAT-7	CTBS
Most Recent Norms Testing				
Date	Spring Norms: April 3-28, 1995	Spring/Fall Norms: 1992	Spring/Fall Norms: 1992	Spring/Fall Norms: 1996
Sample	N=approx 250,000 (spring); 200,000 (fall) (1000 districts) Sampling conducted to represent the national school population in terms of region, SES, urbanicity, and ethnicity.	N=approx 250,000 (spring); 200,000 (fall) (1000 districts) Sampling conducted to represent the national school population in terms of region, SES, urbanicity, and ethnicity.	N=approx 100,000 (spring); 79,000 (fall) (300 districts) Districts selected through stratified random sampling technique using SES, urbanicity, and ethnicity as variables.	N=176,000 Norming group was a nation-wide sample.
Skills Addressed				
Reading	• Vocabulary • Reading comprehension	• Vocabulary • Reading comprehension • Listening comprehension • Word analysis	• Vocabulary • Reading comprehension • Listening comprehension • Word recognition • Spelling	• Vocabulary • Reading comprehension • Reference skills • Word analysis
Mathematics	• Problem solving • Arithmetic procedures • Reasoning • Patterns and relationships • Concepts of shape and space	• Problem solving • Math concepts and estimation • Data interpretation • Computation	• Problem solving • Math concepts • Arithmetic procedures	Total score is a combination of the scaled score for the mathematics test and the mathematics computation test

SAT-9:	Stanford Achievement Test, Ninth Edition
ITBS:	Iowa Test of Basic Skills
MAT-7:	Metropolitan Achievement Test, Seventh Edition
CTBS:	Comprehensive Test of Basic Skills, Terra Nova

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One feature of the study design that should minimize the consequences of any linking errors is the use of the same standardized test within each district. Moreover, the presence of the randomized design within each district ensures that any biases arising from comparing scores across different grade levels, for example, are evenly distributed across both treatment and comparison schools. Linking errors, thus, do not affect any comparisons between schools within districts employing the same standardized test. Linking errors only affect comparisons across districts using different tests. In this study, the key comparisons are between treatment and comparison schools within districts. In the analysis of achievement data, the focus is therefore on estimates of within-district effects, because these are least affected by any linking errors. To obtain greater statistical power, the analyses are aggregated across school districts; the resulting effect estimate is an estimate of the average within-district effect. While errors in linking different tests may attenuate the true impact somewhat, the weighted average across districts is still an unbiased estimate of impact.

Linking, in a strict psychometric sense, is the weakest form of statistical equating available and can take multiple forms: linking forms and levels of a single test edition and linking different tests. The linking approach relies on existing conversion tables to the largest extent possible.

The approach used to accommodate the existing disparate tests involved identifying one standardized test to serve as the "standard metric." All other tests were then linked to the scale score metric of that standard test. The natural choice for the standard metric was the test used by the most schools and districts. Given the districts and the number of schools included in the study, the standard test chosen was the SAT-9, used by three districts with a combined total of 50 schools. Scores on the other tests in use, the CTBS, the ITBS, and the MAT-7, were then linked to the scale score metric of the SAT-9.[30]

Similarly, linking procedures were employed to conduct pooled analyses of school-level effects on academic achievement. Each school in the study provided average national percentile rank scores by grade level for their respective test. Percentile rank scores, however, are not amenable to statistical manipulation, as they do not represent equal units along the same scale. That is, the difference between the percentile ranks of 10 and 15 do not necessarily reflect the same difference in achievement as the difference between the percentile ranks of 45 and 50. Thus, these scores were subsequently converted to normal curve equivalent scores (NCEs). These are normalized scores with a mean of 50 and a standard deviation of 21.06, and are amenable to algebraic manipulation when averaging scores across groups.

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[30] This linking process was based on the assumption that the norm groups from the different tests are representative samples from the same population. The equipercentile method was used to link the two tests, whereby each possible score, X, on the MAT-7 was assigned a SAT-9 scale score equivalent. The SAT-9 equivalent to score X on the MAT-7 is the SAT-9 scale score with the same percentile rank (in the SAT-9 national norm group) as score X has in the MAT-7 norm group. That is, if score X on the MAT-7 has a percentile rank of 54 (in the MAT-7 national norm group) and a SAT-9 scale score of 450 corresponds to a percentile rank of 54 (in the SAT-9 national norm group), then score X on the MAT-7 was assigned a SAT-9 equivalent score of 450. Similar linking procedures were used to equate test scores on the ITBS and the CTBS to the SAT-9.

Findings

Changes in test score performance were measured at both the student and school levels. At the student level, gain scores were measured for the same students as they moved from one grade to the next. For example, scores for students in fourth grade in SY 1999-2000 were compared to their fifth grade scores a year later. On the other hand, changes in test scores at the school level were measured for different cohorts of students at the same grade, one year apart (e.g., third graders in SY 1999-2000 versus third graders in SY 2000-2001). Findings for all analyses are presented in Appendix D.

Student Gain Scores

Gains in academic achievement test scores were measured by grade for both reading and mathematics. Overall, for student-level test scores, there were no significant differences favoring the treatment schools. There was also no consistent set of results for any of the six school districts. An analysis was also conducted whereby test score results by grade were combined within each school. These analyses, which yielded an average scale score per school, did not show any significant differences between treatment and control school students on either math or reading. Finally, the analyses measuring differences in impact among free and reduced-price eligible students versus paid-eligible students did not display a consistent pattern of results across grade levels or test (Exhibit G-1). Differences in impact for subgroups based on minority status, gender, and grade were not consistent in terms of any statistically significant differences (Exhibits G-7 and G-10).[31]

Changes in School-Level Scores

Changes in test scores at the school level showed similar findings. Overall, there were no significant differences in scores favoring the treatment schools. None of the school districts showed any discernible pattern of results at the school level. School-level results by grade were also aggregated within school to yield school-level average NCE scores. These analyses did not show any effects overall on either math or reading. Exhibit 5.22 shows the average school-level scores in reading and math across all districts.

Impacts on Attendance and Tardiness

For children to take full advantage of the learning opportunities provided by school, they must consistently come to school on time. Provision of free school breakfast might serve as an incentive for parents and students to increase attendance and decrease late arrivals. Previous research and anecdotal evidence from ongoing universal-free school breakfast programs suggest that breakfast may indeed offer these benefits. Across several research reports and reviews (e.g., Briefel et al., 1999; Food Research and Action Center, 2001; Murphy et al., 2000b; Pollitt and Matthews, 1998), increased attendance and decreased tardiness are associated with free breakfast programs.

Positive changes in these two outcomes have not always emerged, however. In Minnesota's Fast Break to Learning Program, for example, there was no evidence that universal-free school breakfast increased attendance for treatment versus control schools (Peterson et al., 2001). Given that average attendance rates in this state are already quite high (93 to 96 percent), perhaps significant gains should

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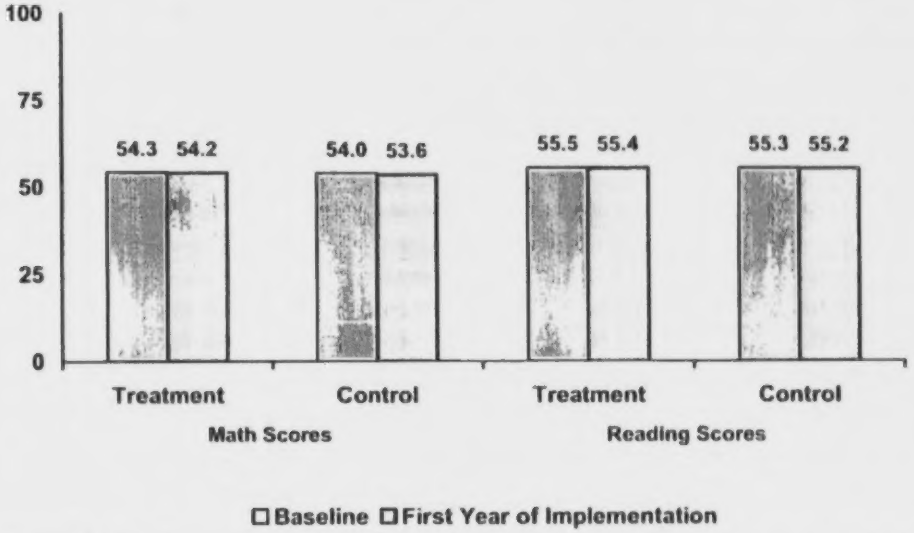
[31] Across the total of 32 tests conducted, there were only three significant findings overall.

Exhibit 5.22

Average Normal Curve Equivalent (NCE) Scores in Reading and Math Across All Schools



N=514 (Based on number of grades across schools).

Source: *Impact Study – School-level Academic Achievement Test Scores, 1999-2000 and 2000-2001*

not be expected. In the most recent report for the Maryland Meals for Achievement Program, tardiness had decreased significantly but attendance had not changed significantly (Murphy et al., 2001). Attendance rates in these schools were also quite high, about 93 percent. While some precedent exists for changes in attendance and tardiness as a result of the provision of free breakfasts, no definitive pattern has been found.

Measures and Analytic Variables

All districts have computerized attendance records that were used for this analysis. Data were obtained at the student and school level for the baseline and first year of SBPP implementation (SY 1999-2000 and 2000-2001). Attendance information was available for all schools in the study and for 81 to 100 percent of the sample students in each district across the two years of data collection. Attendance is defined as the number of days present at school divided by the total number of school days the child was enrolled. The mean percentage of days students were present was compared between treatment and control students and schools.

Tardiness is defined as the number of days the student was late as a percent of the number of school days the child was enrolled. Data on tardiness were not consistently available at the school and district levels. In only two of the Districts (C and D) were data on tardiness available at both levels. District E could not provide these data on either level. The other Districts (A, B and F) had student-level data available, although the collection of these data in District F was inconsistent across schools.

Given the importance of this measure, and its inclusion in the Congressionally mandated request for the evaluation, the analysis was conducted. However, the amount of missing information is important to consider when interpreting the results.

Findings

This study found no effects of universal-free school breakfast on either attendance or tardiness in any of the main or subgroup analyses conducted. The relatively high rates of attendance and low rates of tardiness, however, might have affected the ability of the program to exert much influence on these outcomes. The limitations of the data on tardiness should also be kept in mind when assessing the results.

The levels of attendance were quite high across all schools and districts. For students in the impact sample, attendance ranged from 95 to 96 percent across treatment and control schools. At the school level, overall attendance ranged from 89 to 96 percent.

The mean number of student days tardy as a percent of days enrolled in school ranged from 0 to 3.3 percent across treatment and control students in the Impact sample. The rates for school-level tardy days ranged from 1.7 to 2.2 percent of days enrolled in the two districts that could report these data.

Impacts on Food Insecurity

As discussed in Chapter One, the SBP was initiated largely in response to concerns about hunger among poor children and the consequences of hunger on their performance in school. Researchers have linked food insecurity to negative academic, health, and psychosocial outcomes (Alaimo et al., 2001; Connecticut Association for Human Resources, 1986). One of the questions asked in this evaluation is whether or not the availability of universal-free school breakfast affects the level of food insecurity or hunger in the child's household. The desired effect would be a decrease in hunger among the children in the household, and improvement of their overall academic and psychosocial status.

Two studies that have included measures of hunger have found some positive outcomes associated with participation in universal-free school breakfast programs. In one study, researchers found that an increase in school breakfast participation was associated with fewer reports of the symptoms of hunger by students (Murphy, et al., 2000b). In another, staff in schools implementing universal-free school breakfast programs reported fewer complaints of hunger from students (Murphy and Pagano, 2001).

Measure and Analytic Variables

The Household Food Security Scale was used to assess food insecurity in households of children in the SBPP (Bickel et al., 2000). The entire 18-item scale was included in the Parent Survey.

Food insecurity and hunger as defined by this measure are conditions resulting from financial resource constraints. Specifically, the measure is concerned with food insecurity and hunger caused by the lack of food in a household or money to buy food. Thus, hunger is defined here as a severe stage of food insecurity, and does not refer to hunger associated with such things as dieting or being too busy to eat. While food insecurity is associated with poverty, it is only one area of basic need and not synonymous with it.

The Household Food Security Scale is a continuous, linear scale that measures the degree of severity of food insecurity in a household in terms of a single numerical value. The 18 items on the scale have a 12-month reference period. The scale includes both qualitative and quantitative aspects of the household's food supply (e.g., well-balanced meals, how often the money for food ran out), as well as psychological and behavioral responses by household members to the supply of food (e.g., worrying about the food supply, limiting the kinds of food purchased). The scale of food insecurity is expressed by numerical values from 0 to 10, and describes the stages of food insecurity from "food secure" (score of 0) to "food insecure with hunger" at its most severe (score of 10).

Two characteristics of the Household Scale should be noted. First, the measure reflects the household's experience over the previous 12 months. Thus, there may have been days or a short period of food insecurity captured by the measure, even though the household is currently food secure. Second, it is a household measure, and not designed for assessing individual-level estimates of food insecurity.

Since 1995, the federal government has used the Household Food Security Scale to measure the extent and severity of food insecurity in households across the country through the Current Population Survey Food Security Supplements. The most current data from these efforts (Nord et al., 2002) shows that 89.5 percent of U.S. households were food secure throughout the year, while the remaining 10.5 percent were food insecure. In about one third of the food-insecure households, one or more members were hungry at least some time during the year because they could not afford enough food.

Results of these efforts to assess food insecurity across the U.S. have suggested that the Scale overstates the number of children experiencing food insecurity or hunger. In most food insecure households, the adults will go hungry first, to protect their children, especially younger children, from an inadequate supply of food (Hamilton et al., 1997). Because of the importance of being able to monitor children's food insecurity and the federal programs designed to address this basic need, USDA has recently developed the Children's Food Security Scale (Nord and Bickel, 2002). The children's scale consists of eight items of the larger 18-item Household Food Security Scale that refer to the food-related experiences and conditions of children in the household. The goal of the scale is to identify households in which one or more children have been hungry at times during the previous 12 months because of financial constraints.

The Children's Food Security Scale, like the household scale, asks questions that attempt to determine the level of severity of the food deprivation experiences and conditions (e.g., reliance on lower-cost foods or inability to afford more food). It is important to note that like the full Household Scale, the Children's Scale describes an entire 12-month period. Thus, identifying children in food insecure households means that there were times during the previous year when children were hungry, not that they were hungry every day or even every month.

It should also be noted that while the new measure focuses on children, it is still a household-level scale. It identifies households with food insecurity and hunger among children. It also applies to all children in the household, from birth through age 17. Thus, like the Household Scale, it is somewhat limited as a measure in this evaluation of the SBPP, as it does not specifically focus on the one child in the family that is included in the study sample. Nord and Bickel (2002) describe research that suggests that younger children are the most protected members of the household; thus, even though the Children's Scale focuses on children, it may still overstate the severity of food insecurity for these elementary school children. Nonetheless, it does provide a more focused look at an important condition among the households in the sample.

Nord and his colleagues (2002) report that nationally about 0.7 percent of all households with children were food insecure with hunger among children in 2000.

Results from the SBPP data collection were tabulated and analyzed for both the Household and Children's Scale, using the methodology outlined in Bickel and Nord (2000) and Nord and Bickel (2002), respectively. Household food security status and mean scale scores for both Household and Children's Scales were used in the analyses reported below.[32]

Findings

Seventy-seven percent of the households with students in the SBPP sample were food secure according to the Household Scale, which is considerably less than the national figure of about 90 percent. Sixteen percent of the SBPP households were food insecure without hunger (this was 15.5 percent nationally in 2000), and the remaining 7 percent of households were food insecure with hunger (compared to 3.1 percent nationally). There were no differences between treatment and control school students on these categories of food security status.

The mean Household Food Security Scale score for all districts combined was 1.04 for treatment and 1.10 for control households of SBPP children, which was not statistically significant.

An analysis was also done to see if there was any difference on the Household Scale between food insecurity in households with children that are eligible for free and reduced-price meals and those with children eligible for paid school meals. There was a significant interaction on the Household Scale of treatment and eligibility status by school district (Exhibit 5.23). In three of the six sites, treatment students in the paid category had higher food insecurity than their control counterparts, while the opposite was true for free and reduced-price eligible students: Treatment school free and reduced-price eligible students had less food insecurity than their control counterparts. This was significant for each of these three districts ($p<.05$).

The analysis of the Children's Food Security Scale score revealed no overall difference between treatment and control students' households. When eligibility status was included in the model, there was again no overall difference between treatment and control.

Impacts on Student Health

Body Mass Index

Overweight in children is an important nutrition-related problem in the United States. The number of overweight school-age children has doubled within the last 30 years, and an estimated one in five

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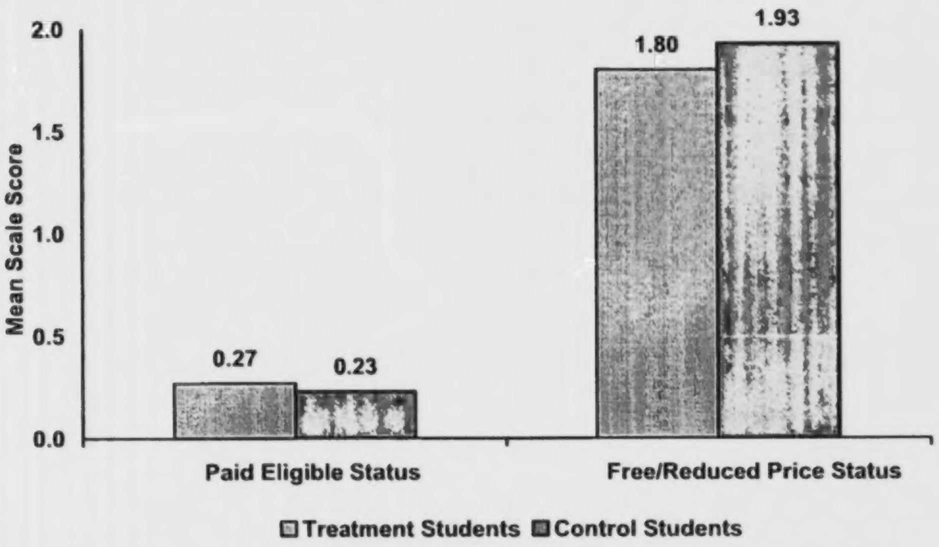
[32] Food security status (i.e., food secure, food insecure without hunger, food insecure with hunger) based on the Children's Scale was not used here as it is still being researched and discussed at USDA.

Exhibit 5.23

Overall Household Food Insecurity[1] by Treatment and School Meal Eligibility Status



N=3,375

[1] Lower scores indicate less food insecurity.

Note: Interaction between treatment, eligibility status, and district is statistically significant at the .05 level.

Sources: Impact Study – Parent Survey, Spring, 2001

children are now overweight (Troiano and Flegal, 1998). There is evidence that overweight during childhood continues into adulthood (Guo et al., 1994) and is associated with increased risk of diabetes, cardiovascular disease, hypertension, and other diseases. As discussed in an earlier section, a potential concern associated with the implementation of universal-free school breakfast is that it might contribute to excessive food energy intake, resulting in or exacerbating overweight and obesity problems among students. But research suggests that eating breakfast, including school breakfast, has nutritional status and health benefits (Briefel et al., 1999; Pollitt and Mathews, 1998). It was therefore difficult to predict the direction of the impact of universal-free school breakfast on students' weight status, as measured by the body mass index (BMI).[33] Information from the analysis of impacts on students' dietary intake, which did not show effects of free breakfasts on total food energy intake for the vast majority of students, suggests there would be little likelihood of an impact on students' BMI.

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[33] BMI, based on height and weight, provides a benchmark for determining overweight and underweight in children. It is more highly correlated with body fat than any other indicator of height and weight (CDC/NCHS, 2001).

The analyses presented below address the question of whether the availability of universal-free school breakfast was associated with an increase in overweight among students. It is important to note that while participation in school breakfast could affect a child's body mass over a long period of time, the duration of exposure to the free breakfasts was relatively short (less than a full school year). Ideally, the effect of universal-free school breakfast on students' weight status would be measured longitudinally.

Measures and Analytic Variables

Three measures were used to assess the impact of free breakfasts on student's weight status:

- Body Mass Index percentile,
- The percent of students "at risk of overweight," and
- The percent of students considered "overweight."

During data collection in the schools, standing height and weight were measured directly by trained interviewers using standardized procedures and portable equipment (Shorr stadiometers and Seca electronic scales). Students were asked to remove their shoes and any outer layers of clothing or headwear prior to taking measurements. There were no adjustments to heights or weights made for heavy clothing, shoes, or interfering hair as these cases were relatively rare and did not seem to affect results. BMI was calculated for each student for whom a height and weight measurement was available.[34]

As children grow, their body fatness changes, so the interpretation of BMI depends on child age. Additionally, girls and boys differ in their body fatness as they mature. The Centers for Disease Control and Prevention (CDC) plots BMI according to age- and gender-specific charts to estimate BMI percentiles. The CDC charts (growth curves) were used to create a variable for BMI percentile for all students for whom BMI could be calculated. The BMI percentile was then used in conjunction with cutoff values recommended by expert committees and the CDC to identify children who were overweight or at risk for overweight (CDC/NCHS, 2000; Himes and Dietz, 1994). Students whose BMI percentile, adjusted for age and gender, was at or above the 95th percentile were defined as "overweight." Students whose BMI percentile was at or above the 85th percentile were categorized as "at risk for overweight;" this group also included overweight students.[35]

Findings

There were no differences associated with the availability of universal-free school breakfast in the proportions of treatment and control school students classified as overweight or at risk of overweight, based on their body mass index. Of potential concern, but unrelated to the universal-free school breakfast intervention, are the higher than average prevalences of at risk for overweight and overweight among students in both treatment and control schools in the SBPP school districts.

Body Mass Index Percentile. Results of the analysis of students' BMI percentile are shown in Appendix D, Exhibit D-78. They show that access to universal-free school breakfast had no significant effect on students' body fatness. The mean BMI percentile for students in treatment schools was 64.6 and in control schools, 63.4. These values are somewhat higher than would be expected from a national sample of children.

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[34] Data for 10 students whose BMI and weight-for-age percentiles were extremely high were excluded from the analysis.

[35] A BMI percentile at or below the 5th percentile indicates a child is "underweight." The proportion of underweight students in the SBPP sample was very small, approximately 2 percent.

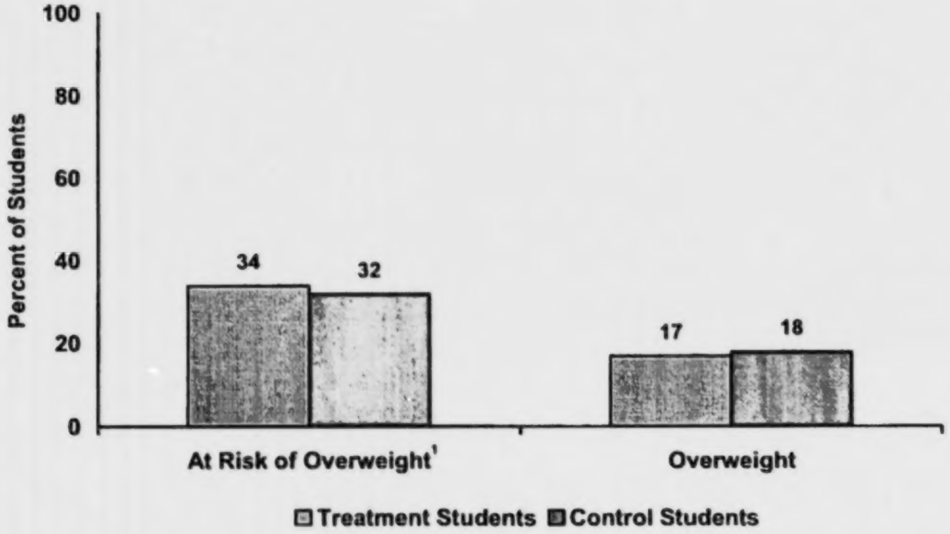
There was no significant difference in impacts on BMI percentile by students' school meal eligibility status, minority status, gender, or grade.

Prevalence of Overweight and At Risk for Overweight. The availability of universal-free school breakfast had no effect on the percent of students characterized as overweight or at risk for overweight based on their BMI percentile. Exhibit 5.24 shows the results of the analysis using both criteria for all districts combined. There were no statistically significant differences in the prevalence of overweight or risk for overweight between students in treatment and control schools. Note that the proportion of students considered overweight in this sample (approximately 17 percent) is higher than that found in initial results from the 1999 National Health and Examination Survey (NHANES IV). The prevalence of overweight was about 13 percent among U.S. children 6 to 11 years of age and 14 percent for adolescents 12 to 19 years of age in that survey (NCHS, 2001).

Findings from the analysis of the prevalence of overweight and risk of overweight provided no evidence of a difference in impacts of universal-free school breakfast by school meal eligibility status or any of the other subgroups analyzed.

Exhibit 5.24

Prevalence of At Risk of Overweight and Overweight Based on BMI Percentile



N=4,242

[1] Includes students classified as overweight.

Source: Impact Study – Height and Weight Measurements, Spring 2001

Health Status and School Nurse Visits

One of the outcomes that school breakfast might be expected to impact would be student health. If students are eating school breakfast, it should affect how they feel on a particular day, and consistent participation might lead to improved nutrition and longer-term improvement in health status.

While the link between breakfast and health status has been established (see Briefel et al., 1999), very few of the studies of universal-free school breakfast programs report on health outcomes. One exception is a 1997 study of a pilot breakfast program in Minnesota by Dr. Kyla Wahlstrom and her colleagues, who questioned school staff, parents, and students about the benefits of universal-free school breakfast. Among the positive benefits reported were reductions in health and stress problems, including a decrease in the number of visits students made to the school nurse for headaches and stomachaches (see Peterson et al., 2001). In the latest evaluation of the Maryland universal-free school breakfast program, there were slightly fewer reported visits to the school nurse associated with participation, but this was not significant (Murphy and Pagano, 2001).

Two sources of information on student health were used in the current evaluation: parents and records of school nurse visits. Each is described more fully below.

Health Status

Measure and Analytic Variables. Health status of students in the Impact Study was examined in the Parent Survey. Parents were asked to rate their child's health from poor to excellent, to compare their child's health in Spring 2001 to the previous year (before SBPP was implemented), and whether their child had a health impairment that had lasted or was expected to last a year or more.

Less than 4 percent of the sample rated their child on the lower end of the health spectrum (fair or poor health). Thus, an analysis of students in the "excellent" category was performed to see whether those students who went to schools offering universal-free school breakfasts were more likely to have this higher rating. The mean percent of students reported to be in excellent health was calculated and compared for treatment and control students.

For the other interview questions, means were calculated for the percentage of students reported to have a health problem and for those reported to have improved health over the last year.

Findings. Overall, 56 percent of parents rated their children as having "excellent" health; 41 percent as having "good" or "very good"; 3 percent as having "fair"; and less than 1 percent as having "poor" health. The ratings were nearly identical for treatment and controls across all categories. Ratings for "excellent" health were given for 57.7 percent of treatment and 55.1 percent of control students, but this difference was not significant. There was a significant difference when school meal eligibility was included in the analysis. As a result of universal-free breakfast, parents of students with paid-eligibility were more likely to report their children to be in excellent health than parents of free and reduced-price eligible children ($p<.05$; Exhibit G-3).

There was no difference in the percent of students reported to have a health problem (19.3 percent of treatment and 20.4 of control students) or in the percent of students who were reported to have improved their health status over the year of the universal-free intervention (18.7 percent for treatment and 20.9 for control students).

School Nurse Visits

Measure and Analytic Variables. Logs of school nurse visits were obtained for about 20 weeks in all SBPP schools from January to May 2001. School nurse's or health clinic staff provided totals of reported incidents for contagious illnesses, injuries, and minor and acute illnesses broken down by time of visit (morning or afternoon). Visits to the nurse's office for medications were not included in the counts. It was not possible for schools to provide logs identifying individual students from the study sample. The logs were kept for all students visiting the nurse's office and the measure is thus a school-level rather than student-level outcome. The mean number of daily visits recorded over a 20-week period was calculated for each district and averaged across all districts. The data were also analyzed by time of day of nurse visit, as it might be expected that school breakfast would have greater impact on morning than afternoon visits.

Findings. Overall the school-level mean for number of daily visits to the nurse's office or health clinic was about the same, 3.9 for treatment and 4.0 for control schools.

When the data were analyzed by time of school nurse visit, none of these differences were significant. The overall means were 2.3 for treatment and 2.2 for control schools for morning nurse's visits. For afternoons the overall means were 1.6 for treatment and 1.8 for control.

In summary, universal-free school breakfast was not associated with changes to student health outcomes measured in this study. There was no effect of the availability of universal-free school breakfast on BMI or the prevalence of overweight or risk of overweight. Parents' perceptions of children's health were unchanged by the availability of universal-free school breakfast for students, as were school records documenting visits to the school nurse or clinic.

Chapter Six

Discussion of Findings

The Evaluation of the School Breakfast Program Pilot Project (SBPP) is a congressionally mandated study to assess the implementation and impact of a three-year universal-free school breakfast demonstration in an economically mixed, geographically diverse sample of elementary schools. The objectives of the evaluation are to document how universal-free school breakfast is implemented, its costs, and the administrative requirements it places on schools, and to examine the effects of universal-free school breakfast on participation and a range of student outcomes, including dietary intake, school attendance and tardiness, classroom behavior and discipline, cognitive functioning, and academic achievement. The interim report presents the results of data collected for the year before the SBPP was initiated, school year (SY) 1999-2000, and the first year of implementation, SY 2000-2001.

Summary of the Evaluation

The evaluation employs a randomized experimental design, first pairing participating schools within each of the six participating school districts and then randomly assigning each school in the pair to either a treatment (universal-free school breakfast) or control (regular SBP) group. Classrooms in grades two through six were randomly chosen within each school; students in these classrooms were then stratified by eligibility status and prior breakfast participation, and randomly selected from each stratum. There were 153 schools and 4,358 children included in the evaluation.

Baseline data for SY 1999-2000 came entirely from school administrative records. Implementation and Impact Study data for the first year of SBPP implementation were collected during Spring 2001. Data for the Implementation Study were collected primarily from interviews with school district administrators, school food authority (SFA) directors, school principals, teachers, cafeteria staff, custodians, and students. School breakfast menus were also collected over the course of a target week. The climate of the school was assessed through a teacher survey. Response rates for all implementation instruments ranged from 95 to 100 percent.

The Impact Study employed a broad range of measures to assess both short- and long-term student outcomes. Respondents included students, parents, and teachers. School records were also collected to study school- and student-level impacts. Key outcomes measured included school breakfast participation, breakfast consumption patterns, dietary intake at breakfast and over 24 hours, household food security status, school attendance, health, cognitive functioning, behavior, and academic achievement. Response rates for the Impact Study were quite high, ranging from 80 percent for parent interviews to 100 percent for student measures.

Implementation Study Findings

A brief description of the findings related to each research objective is presented below.

- **Document the various ways in which schools choose to implement universal-free school breakfast.**

The six school districts in this evaluation differed in how they implemented universal-free school breakfast in their treatment schools. The decision to apply to be a part of the SBPP was made at the district level, but once the districts were chosen, most of the key program decisions were made at the school level. Determining whether breakfast should be eaten in the classroom or not turned out to be a key decision, as participation was much higher for students with the classroom breakfast option. Of the 79 treatment schools, 18 served breakfasts that were eaten in the classroom.

Despite the short timeline for introducing the SBPP, most schools geared up to serve free breakfasts in a matter of weeks. Overall, the implementation went smoothly. Administrators, school staff, parents, and students were generally pleased with universal-free school breakfast. Administrators were pleasantly surprised with how well the program was rolled out, and negative reactions expected from parents never materialized.

Schools that implemented universal-free school breakfast had to develop new procedures for delivering and serving food, collecting trash, and keeping records. In general, however, these issues did not cause major problems for implementation. While a major concern anticipated for classroom implementation was loss of teacher preparation time or instruction time, interviews with teachers in schools with classroom breakfast reported that it had little or no effect.

- **Assess the effect of universal-free school breakfast on paperwork, costs, and other administrative requirements.**

The effect of universal-free school breakfast on paperwork and reporting cannot be definitively addressed at this time. Principals did report an increase in reporting requirements and need for some additional staff time. However, since all additional reporting requirements resulting from the SBPP were associated with gathering data for the evaluation, it is not clear whether the changes identified by the principals were due to the program itself, the evaluation, or both. This will be clarified in a follow-up survey planned for SY 2002-2003.

There was no evidence from the review of breakfast menus that the implementation of universal-free school breakfast had an effect on schools' compliance with the SBP nutrition standard or the degree to which breakfasts met other dietary recommendations.

In terms of costs, the treatment schools fared better than control schools. The evaluation found that increased participation led to lower per-meal labor costs in treatment schools. The combined food and labor costs per breakfast were about 11 percent lower in treatment than control schools. This per-meal cost was 18 percent lower than control schools for treatment schools with classroom breakfast. Overall, treatment schools, which were reimbursed at the free meal rate for all breakfasts served, had revenues that were about 40 percent higher than food and labor costs. Control schools, which continued to be reimbursed based on participants' school meal eligibility, had revenues that were about 28 percent higher than these costs.[1]

Treatment schools also experienced an increased workload and some need for additional staff. The workload of cafeteria staff increased and additional assistance was needed to supervise the increased number of breakfast participants.

Impact Study Findings

The objectives for the Impact Study and the related findings are presented below.

- **Assess the effects of universal-free school breakfast on student participation.**

There was a significant overall increase in school breakfast participation as a result of offering universal-free school breakfast in treatment schools. Overall, participation among treatment school students increased by about 16 percentage points for treatment school students over and above the small increase (1 percentage point) for control students. The range of participation increase was dramatic, from 7 percentage points in one district to 34 percentage points in another. This largest increase took place in the district where all treatment school students ate breakfast in the classroom and is in line with other universal-free programs where classroom breakfast was also implemented (e.g., Murphy et al., 2001; Murphy and Pagano, 2001).

- **Assess the effects of universal-free school breakfast on student outcomes.**

Despite the increase in participation, there was no consistent pattern of positive effects on student outcomes associated with the availability of universal-free school breakfast. The rate of breakfast skipping was low overall—less than 4 percent for students in both treatment and control schools. The likelihood of consuming a substantive breakfast, defined as food from at least two food groups and more than 10 percent of the Recommended Dietary Allowance (RDA) for food energy, was slightly but significantly higher among students attending treatment schools (80 percent) versus those attending control schools (76 percent). This study does not dispel the concern of some that universal-free school breakfast could lead children to consume more than one breakfast in a given day, one at home and one at school. Using the same definition of a substantive breakfast as above, treatment school students were 3 percentage points more likely to consume more than one substantive breakfast as their controls. However, the incidence of consumption of more than one nutritionally substantive breakfast for both groups was low (7 percent for treatment school students, 4 percent for controls). Nonetheless, students who consumed the additional breakfasts had higher food energy intakes at both breakfast and over a 24-hour period than those who did not.

The great majority (93 to 100 percent) of students in both treatment schools and control schools had 24-hour dietary intakes that were adequate for vitamins and minerals and exceeded 80 percent of the RDA of food energy and protein. On the other hand, few students in either group met dietary recommendations for total fat, saturated fat, or sodium. The availability of universal-free school breakfast was thus not related to students' likelihood of meeting daily dietary requirements and other recommendations.

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[1] While food and labor costs make up the major share of breakfast costs, other costs (e.g., custodial time) also would affect this estimate. In addition, other minimal sources of revenue, such as à la carte sales, were not included.

For most of the other student outcomes measured—cognitive and social/emotional functioning, attendance and tardiness, food insecurity, body mass index, health status, and academic achievement—there were essentially no differences between treatment and control school students found. The few significant differences found on the behavior ratings were in the negative direction, indicating worse outcomes for students with access to universal-free school breakfast.

Conclusions

A key message from the first year of this evaluation is that universal-free school breakfast can be administered in a variety of settings in economically mixed, geographically diverse schools across the country. It can be implemented fairly smoothly and quickly, with the support of school district and school administrators. In-classroom breakfast service is associated with the biggest jumps in participation. This participation increase in treatment schools helps fuel a sizeable per-meal cost benefit without sacrificing the nutritional quality of the meals. The increases in participation did not, however, translate into any substantial effect, either positive or negative, on student outcomes.

The conceptual models presented in Chapter One helped to shape the kinds of questions asked and the outcomes studied in this evaluation. The implementation of universal-free school breakfast in the SBPP was considered a key determinant of the school outcomes, and its direct influence on participation was expected to fuel positive changes to student outcomes.

The way in which the SBPP was implemented is thus key to understanding the results of this study. In addition, factors other than the SBPP implementation influence these outcomes and need to be considered. Some are "fixed" factors such as age, gender, household structure, and characteristics of a student's school. Other factors, such as the attitudes and perceptions of students and parents, pre-exist but can be shaped by the implementation of the SBPP. Thus, for example, the SBPP could change the attitude of students and parents toward school breakfast. In trying to understand the results of this study, it would be helpful to ask some specific questions related to the key components of the models.

Was the implementation of universal-free school breakfast strong enough to affect the changes expected from the SBPP?

The pathway through which outcomes are to be affected by the SBPP is through increased participation in school breakfast. The results, however, suggest fairly modest increases in overall participation in the first year of implementation, about 16 percentage points over and above what was experienced in the regular SBP in control schools. Clearly these rates could be higher. Implementing universal-free school breakfasts in classrooms and making it an integral part of the school day improved participation even more in this pilot and other universal-free programs (e.g., Maryland; see Murphy and Pagano, 2001a.). Other strategies, such as promoting the program more than was done in these districts, probably also could help in encouraging participation.

Note, however, that even in schools where participation increased by 65 percentage points (in the 18 in-classroom treatment schools), treatment student outcomes were not significantly different from those of control students (see Appendix F, page F-27 and F-28).

Were positive results masked by the 'dilution effect'?

The gain in participation between treatment and control schools was lower than the 25 percentage points expected when this study was designed (Ponza et al., 1999). Moreover, the greatest gains were seen for students with paid school meal eligibility. However, given the high levels of breakfast consumption in the sample, where all but a small percentage of students eat breakfast and most eat a nutritionally substantive breakfast, it is difficult to conceive how the dilution of the treatment could be avoided in this particular sample.

Could universal-free school breakfast show increased participation and improvement in outcomes in other schools or with different students?

The objective of this study was to evaluate universal-free school breakfast across a broad sample of school districts and schools. The students in each district represented a mix of varying economic and other demographic characteristics. To appropriately address whether different outcomes would be obtained within certain types of schools or students (e.g., high-poverty schools, students from low-income families), an experimental study with that focus would have to be conducted.

Would a different study design or set of outcome measures be more sensitive to differences in student outcomes?

This study used an experimental design, the strongest and most appropriate for answering the main impact questions. As such, it has a clear advantage over previous studies of school breakfast, where quasi-experimental designs severely limit the interpretation of the findings.

This study was also well implemented. Response rates for schools, students, and parents ranged from 80 to 100 percent. Interviewers were trained extensively on the assessment battery and quality-control checks were performed at several points during the field period. Interviewers also noted when there were problems with the measures or if the respondent was considered unreliable for any reason. The outcome measures utilized were chosen because they are either used routinely in other studies or are typical of other measures, specifically in other studies which have previously shown positive effects of the School Breakfast Program.

Next Steps for the Evaluation

The findings reported here are for the first year of SBPP implementation. The districts have completed their second year (SY 2001-2002) and will complete their final year in SY 2002-2003. A more limited set of impact measures will be collected both years from school records, including data on participation, attendance, tardiness, and achievement tests. Another round of implementation interviews and site visits will also take place in the Spring of 2003 to assess how the SBPP has evolved in the six districts over the three years of implementation. These data will be analyzed and discussed in a final evaluation report to be completed in 2004.

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APPENDIX A

SUPPLEMENTARY EXHIBITS: IMPLEMENTATION STUDY

Appendix A

Supplementary Exhibits: Implementation Study

The tables appearing in this appendix provide detailed background for the findings described in Chapter Three of the report. They are grouped by respondent category as follows:

- District Administrator (Exhibits A-1 to A-6)
- Principal (Exhibits A-7 to A-38)
- Cafeteria Manager (Exhibits A-39 to A-62)
- Teacher (Exhibits A-63 to A-75)
- Custodian (Exhibits A-76 to A-79)
- Students and Parents (Exhibits A-80 to A-83)

The final section contains tables from the Breakfast Menu Survey. Most results are displayed as percentage distributions comparing:

- Control schools and treatment schools;
- Treatment schools serving breakfast in the classroom and treatment schools not serving breakfast in the classroom; and
- The aggregate of all schools within each of the individual districts.

Differences between control schools and treatment schools and between classroom treatment schools and non-classroom treatment schools have been tested for statistical significance using two-tailed *t*-tests and chi-square tests, as appropriate. Where statistically significant differences have been observed, they are noted by ** for $p<.01$ and * for $p<.05$.

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School District Administrator

Exhibit A-1

Percent of School District Administrators by the Role They Played in Districts' SBPP Applications

Role	N	Percent
Chiefly responsible for district application	6	0.0
Strongly supportive of district application	6	66.7
Facilitated district application and/or participation	6	66.7
Opposed district participation	6	0.0
Played little or no role in application	6	16.7

Source: Implementation Study - School District Administrator Interview, Spring 2001

Exhibit A-2

School District Administrators' Perceptions of District Goals for Participating in the SBPP

Goals	N	Percent
Increased program participation	6	83.3
Improved motivation of students	6	83.3
Reduced tardiness/unexcused absences	6	83.3
Improved test scores	6	83.3
Reduced visits to school nurse	6	83.3
Other	6	33.3

Source: Implementation Study - School District Administrator Interview, Spring 2001

Exhibit A-3

School District Administrators' Views of District Actions Post-SBPP

Actions	N	Percent
Uncertain/too soon to judge	6	50.0
District would/might use own funds	6	0.0
District would/might extend to all schools	6	0.0
Revert to pre-SBPP	6	0.0
Other [1]	6	66.7

[1] "Other" responses included: could apply for grant money or could try to find local funds to provide selected children with breakfast; and waiting to see results of pilot before making decision.

Source: Implementation Study - School District Administrator Interview, Spring 2001

Exhibit A-4

School District Administrators' Perceptions of How Key Stakeholders have Reacted to Implementation of the SBPP

Stakeholder	N	Strong Opposition	Slight Opposition	Neutral	Slight Support	Strong Support	Don't Know
				Percent			
Principals	6	0.0	0.0	16.7	33.3	33.3	16.7
Teachers	6	0.0	0.0	0.0	50.0	0.0	50.0
Food service workers	6	0.0	0.0	0.0	33.3	33.3	33.3
Custodians	6	0.0	0.0	16.7	33.3	33.3	16.7
Nurses	6	0.0	0.0	0.0	0.0	33.3	66.7
Bus drivers	6	0.0	0.0	50.0	0.0	0.0	50.0

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School District Administrator Interview, Spring 2001

Exhibit A-5

Percent of School District Administrators Reporting that SBPP had Effect on District Administration or Parent/Community Relations

Effect	N	Percent
District administration	6	33.3
Parent/community relations	6	16.7

Source: Implementation Study - School District Administrator Interview, Spring 2001

Exhibit A-6

School District Administrator Attitude Toward the SBPP and Possible Future Changes

		Response			
Item	N	Yes	No	Maybe	Don't Know
		Percent			
If had to do over, would district choose to participate in SBPP?	6	66.7	0.0	33.3	0.0
Anticipate any changes next year in how universal-free school breakfast implemented?	6	33.6	50.0	0.0	16.7

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School District Administrator Interview, Spring 2001

Principal

Exhibit A-7

Percent of School Principals by Tenure at Present School and Years Experience with the School Breakfast Program, by School Type and District, SY 2000/01

	Tenure as Principal at Present School					Years Experience with the SBP				
School Type/District	N	Median Years	Less than 3 Years	3 – 6 Years	More than 6 Years	N	Median	Less than 5	5 to 10	More than 10
				Percent					Percent	
School Type										
Control schools	73	3.0	39.7	45.2	15.1	70	7.0	28.6	40.0	31.4
Treatment schools	79	3.0	34.2	45.6	20.3	70	9.0	28.6	31.4	40.0
Classroom	18	3.0	33.3	61.0	5.6	14	10.0	40.0	13.3	46.7
Non-classroom	61	3.0	34.4	41.0	24.6	56	9.0	25.5	36.4	38.2
District										
A	16	2.5	56.3	37.5	6.3	14	7.0	35.7	28.6	35.7
B	24	4.5	33.3	33.3	33.3	20	9.0	30.0	30.0	40.0
C	9	3.0	11.1	44.4	44.4	8	4.0	50.0	25.0	25.0
D	34	3.5	32.4	55.9	11.8	31	11.0	16.1	32.3	51.6
E	59	3.0	39.0	45.8	15.3	58	7.0	29.3	46.6	24.1
F	10	3.0	40.0	50.0	10.0	9	11.0	33.3	11.1	55.6
All schools	152	3.0	36.8	45.4	17.8	140	8.0	28.6	35.7	35.7

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-8

Percent of Principals by Role Played in SBP Oversight, by School Type and District, SY 2000/01

	Principal Determines:					
	When Breakfast is Served		Time Allotted		Where Breakfast is Served	
School Type/District	N	Percent	N	Percent	N	Percent
School Type						
Control schools	73	82.2	73	86.3	72	81.9
Treatment schools	79	89.9	79	94.9	78	94.9
Classroom	18	100.0	18	100.0	17	100.0
Non-classroom	61	86.9	61	93.4	61	93.4
District						
A	16	100.0	16	100.0	15	100.0
B	24	91.7	24	91.7	24	87.5
C	9	88.9	9	88.9	9	100.0
D	34	67.6	34	79.4	34	76.5
E	59	91.5	59	93.2	59	93.2
F	10	80.0	10	100.0	9	77.8
All schools	152	86.2	152	90.8	150	88.7

Note: Row percentages are independent.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-9

Percent of Principals Indicating That Selected Factors Are Considered in Overseeing the SBP, by School Type and District, SY 2000/01

School Type/ District	N	Minimizing Non-Teaching Time	Ensuring Time for Nutritious Breakfast	Keeping Teachers Happy	Making Effective Use of Limited Space	Avoiding Messy Classrooms	Supervision	Ability to Deliver Service	Bus Schedules	Class Schedules	Timing of Food Service	Other[1]
							Percent					
School Type												
Control schools	73	38.4	42.5	11.0	35.6	12.3	8.2	5.5	17.8	6.8	4.1	23.3
Treatment schools	79	57.0*	53.2	27.8**	45.6	25.3*	10.1	7.6	11.4	6.3	5.1	39.2*
Classroom	18	61.1	66.7	27.8	50.0	27.8	11.1	0.0	11.1	0.0	11.1	33.3
Non-classroom	61	55.7	49.2	27.9	44.3	24.6	9.8	9.8	11.5	8.2	3.3	41.0
District												
A	16	50.0	56.3	12.5	37.5	12.5	6.3	0.0	18.8	6.3	0.0	31.3
B	24	41.7	45.8	8.3	25.0	20.8	8.3	8.3	12.5	8.3	8.3	37.5
C	9	88.9	66.7	66.7	22.2	33.3	11.1	0.0	0.0	0.0	0.0	11.1
D	34	38.2	29.4	20.6	47.1	5.9	8.8	11.8	17.6	11.8	11.8	29.4
E	59	44.1	50.8	15.3	45.8	20.3	11.9	6.8	15.3	5.1	0.0	37.3
F	10	80.0	70.0	40.0	50.0	50.0	0.0	0.0	10.0	0.0	10.0	10.0
All schools	152	48.0	48.0	19.7	40.8	19.1	9.2	6.6	14.5	6.6	4.6	31.6

[1] "Other" responses generally referred to constraints of physical or staffing capacity or to staff and student scheduling issues.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-10

Percent of Principals That Have Direct Contact with District School Foodservice Director and Frequency of Contact, by School Type and District, SY 2000/01

				Frequency of Direct Contact							
School Type/ District	N	Have Direct Contact	N	At Least Monthly	At Least Quarterly	Twice Annually	At Least Annually	As Needed	Occasionally	Often	Never/Almost Never
				Percent of Those Having Direct Contact							
School Type											
Control schools	73	90.4	66	24.2	10.6	6.1	25.8	10.6	1.5	0.0	21.2
Treatment schools	79	92.4	73	23.3	24.7*	1.4	23.3	8.2	1.4	2.7	15.1
Classroom	18	100.0	18	33.3	22.2	0.0	11.1	5.6	0.0	11.1	16.7
Non-classroom	61	90.2	55	20.0	25.5	1.8	27.3	9.1	1.8	0.0	14.5
District											
A	16	100.0	16	43.8	18.8	0.0	0.0	6.3	6.3	6.3	18.8
B	24	87.5	21	9.5	14.3	4.8	52.4	4.8	0.0	0.0	14.3
C	9	100.0	9	33.3	11.1	11.1	11.1	11.1	11.1	0.0	11.1
D	34	91.2	31	16.1	19.4	6.5	32.3	3.2	0.0	0.0	22.6
E	59	89.8	53	20.8	22.6	1.9	22.6	13.2	0.0	0.0	18.9
F	10	90.0	9	55.6	0.0	0.0	0.0	22.2	0.0	11.1	11.1
All schools	152	91.4	139	23.7	18.0	3.6	24.5	9.4	1.4	1.4	18.0

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-11

Percent of Principals by the Nature of Their Relationship with Cafeteria Manager, by School Type and District, SY 2000/01

School Type/District	N	Cafeteria Manager Participates in Staff Meetings	Cafeteria Manager Provides Regular Oral or Written Reports	Meet to Resolve Issues	Informal	As Necessary	Principal Does 'General Check-Ups'	Principal Is in Cafeteria Every Day	No Relationship	Other
						Percent				
School Type										
Control schools	73	8.2	30.1	69.9	16.4	2.7	5.5	1.4	0.0	2.7
Treatment schools	79	10.1	26.6	77.2	17.7	2.5	3.8	2.5	0.0	1.3
Classroom	18	27.8	50.0	72.2	11.0	0.0	5.6	11.1	0.0	0.0
Non-classroom	61	4.9	19.7*	78.7	19.7	3.3	3.3	0.0	0.0	1.6
District										
A	16	25.0	68.8	81.3	0.0	0.0	6.3	0.0	0.0	12.5
B	24	12.5	8.3	79.2	12.5	8.3	0.0	0.0	0.0	0.0
C	9	0.0	55.6	55.6	22.2	0.0	0.0	0.0	0.0	0.0
D	34	8.8	26.5	79.4	14.7	2.9	2.9	0.0	0.0	0.0
E	59	3.4	15.3	72.9	25.4	1.7	8.5	3.4	0.0	1.7
F	10	20.0	70.0	50.0	10.0	0.0	0.0	10.0	0.0	0.0
All schools	152	9.2	28.3	73.7	17.1	2.6	4.6	2.0	0.0	2.0

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-12

Percent of Principals Reporting Unusual Events Occurring in Their Schools During School Years 1999/00 and 2000/01, by School Type and District[1]

	Unusual Events			
	SY 1999/00		SY 2000/01	
School Type/District	N	Percent	N	Percent
School Type				
Control Schools	73	13.7	72	13.9
Treatment Schools	79	21.5	79	19.0
Classroom	18	27.8	18	22.2
Non-classroom	61	19.7	61	18.0
District				
A	16	12.5	16	43.8
B	24	29.2	24	12.5
C	9	22.2	8	50.0
D	34	5.9	34	2.9
E	59	15.3	59	13.6
F	10	50.0	10	20.0
All schools	152	17.8	151	16.6

[1] Respondents were asked to identify unusual events that might have affected school operations or academic achievement. Curriculum changes and key staff changes were among the events most frequently identified.

Note: Row percentages are independent.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-13

Principals' Perceptions of How Representative Their Schools Are of Other Schools in Their District, by School Type and District, SY 2000/01

School Type/District	N	Very Representative	Somewhat Representative	Not at All Representative	Don't Know
			Percent		
School Type					
Control schools	73	21.9	60.3	17.8	0.0
Treatment schools	79	19.0	58.2	20.3	2.5
Classroom	18	33.3	61.1	5.6	0.0
Non-classroom	61	14.8	57.4	24.6	3.3
District					
A	16	31.3	62.5	0.0	6.3
B	24	25.0	58.3	16.7	0.0
C	9	0.0	77.8	22.2	0.0
D	34	14.7	67.6	17.6	0.0
E	59	20.3	50.8	27.1	1.7
F	10	30.0	60.0	10.0	0.0
All schools	152	20.4	59.2	19.1	1.3

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-14

Median Enrollment, Percent of Schools by Enrollment, and Average Percent Change in Enrollment Between SYs 1999/00 and 2000/01, by School Type and District, SY 2000/01

			Enrollment Category, SY 2000/01			Average Percent Change in Enrollment SY 1999/00 – SY 2000/01[1]	
School Type/District	N	Median Enrollment, SY 2000/01	Less than 300	300 to 600	More than 600	N	Percent
				Percent			
School Type							
Control schools	73	480.0	12.3	63.0	24.7	71	-1.16
Treatment schools	79	419.0	25.3	48.1	26.6	79	.06
Classroom	18	501.5	11.1	55.6	33.3	18	.08
Non-classroom	61	390.0	29.5	45.9	24.6	61	.05
District							
A	16	636.5	12.5	31.3	56.3	14	-6.95
B	24	670.5	0.0	25.0	75.0	24	1.99
C	9	450.0	11.1	88.9	0.0	9	-.68
D	34	326.0	35.3	64.7	0.0	34	-1.39
E	59	386.0	23.7	66.1	10.2	59	.03
F	10	697.5	0.0	40.0	60.0	10	2.33
All schools	152	455.0	19.1	55.3	25.7	150	-.52

[1] Average percent change for those schools operating in both school years.

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-15

Percent of Schools Offering Enrichment Programs by Type of Program, by School Type and District, SY 2000/01

School Type/ District	Share of Schools Offering Enrichment Programs		Type of Enrichment Program								
	N	Percent	N	Basic Skills Development	Tutoring and Homework Assistance	Language Instruction	Gifted Program	Arts (Drama, Music, Band, Art, Dance)	Afterschool Classes/ Extended Day	Computer/ Technology	Other[1]
				Percent of Those Schools Offering Enrichment Programs							
School Type											
Control schools	73	95.9	70	40.0	71.4	15.7	42.9	2.9	1.4	1.4	31.4
Treatment schools	79	93.7	74	35.1	71.6	20.3	40.5	9.5	4.1	2.7	40.5
Classroom	18	88.9	16	43.8	56.3	12.5	50.0	6.3	0.0	0.0	43.8
Non-classroom	61	95.1	58	32.8	75.9	22.4	37.9	10.3	5.2	3.4	39.7
District											
A	16	93.8	15	53.3	53.3	26.7	53.3	0.0	0.0	0.0	20.0
B	24	95.8	23	34.8	65.2	13.0	21.7	8.7	13.0	0.0	34.8
C	9	100.0	9	44.4	100.0	22.2	33.3	22.2	0.0	11.1	111.1
D	34	97.1	33	30.3	72.7	27.3	66.7	6.1	0.0	3.0	21.2
E	59	91.5	54	40.7	72.2	14.8	24.1	3.7	1.9	1.9	42.6
F	10	100.0	10	20.0	80.0	0.0	90.0	10.0	0.0	0.0	10.0
All schools	152	94.7	144	37.5	71.5	18.1	41.7	6.3	2.8	2.1	36.1

[1] "Other" responses included: character education; buddy reading (with grandparents); programs funded through 21st Century; and Odyssey of the Mind.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-16

Percent of Schools Reporting Differences in Enrichment Programs Offered in SY 2000/01 from Previous School Year and Reasons for the Adoption of New Programs, by School Type and District

School Type/District	Share of Schools Offering Different Programs		Reasons Different Programs Adopted							
	N	Percent	N	Improve Test Scores	At Teachers' Suggestion	At Parents' Suggestion	State Mandate/ District Decision/Board Suggestion	Improve Learning/ Increase Skills	Grant Made Available	Other[1]
			Percent of Those Schools Offering Different Programs							
School Type										
Control schools	70	34.3	24	33.3	33.3	16.7	16.7	16.7	16.7	45.8
Treatment schools	74	33.8	25	40.0	20.0	8.0	20.0	28.0	4.0	40.0
Classroom	16	56.3	9	55.6	11.1	22.2	11.1	22.2	11.1	44.4
Non-classroom	58	27.6*	16	31.3	25.0	0.0	25.0	31.3	0.0	37.5
District										
A	15	33.3	5	20.0	0.0	0.0	20.0	40.0	0.0	40.0
B	23	26.1	6	16.7	0.0	0.0	16.7	50.0	0.0	100.0
C	9	44.4	4	75.0	50.0	50.0	25.0	0.0	25.0	50.0
D	33	36.4	12	25.0	41.7	8.3	50.0	8.3	8.3	16.7
E	54	31.5	17	41.2	29.4	5.9	0.0	17.6	11.8	47.1
F	10	50.0	5	60.0	20.0	40.0	0.0	40.0	20.0	20.0
All schools	144	34.0	49	36.7	26.5	12.2	18.4	22.4	10.2	42.9

[1] "Other" responses included: a generally perceived need to provide some students with more support; the need for safe, structured after-school mentoring environments; and as a required component of an educational program.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-17

Percent of Schools Offering Extra-Curricular Programs and Types of Programs Offered, by School Type and District, SY 2000/01

School Type/ District	Share of Schools Offering Extra-Curricular Programs		Type of Extra-Curricular Programs									
	N	Percent	N	Sports	Musical	Student Government	Clubs	Arts and Crafts	Scouts	Academic	Safety Patrol	Other[1]
			Percent of Those Schools Offering Extra-Curricular Programs									
School Type												
Control schools	73	79.5	58	74.1	39.7	12.1	32.8	5.2	1.7	5.2	1.7	15.5
Treatment schools	79	68.4	54	79.6	48.1	13.0	48.1	3.7	5.6	0.0	3.7	13.0
Classroom	18	61.1	11	90.9	54.5	9.1	63.6	0.0	0.0	0.0	0.0	0.0
Non-classroom	61	70.5	43	76.7	46.5	14.0	44.2	4.7	7.0	0.0	4.7	16.3
District												
A	16	68.8	11	63.6	27.3	18.2	45.5	0.0	9.1	9.1	0.0	27.3
B	24	100.0	24	91.7	70.8	12.5	33.3	4.2	0.0	8.3	4.2	8.3
C	9	100.0	9	77.8	44.4	22.2	55.6	33.3	22.2	0.0	0.0	33.3
D	34	100.0	34	100.0	38.2	8.8	26.5	2.9	2.9	0.0	5.9	5.9
E	59	49.2	29	44.8	37.9	13.8	55.2	0.0	0.0	0.0	0.0	17.2
F	10	50.0	5	60.0	20.0	0.0	40.0	0.0	0.0	0.0	0.0	20.0
All schools	152	73.7	112	76.8	43.8	12.5	40.2	4.5	3.6	2.7	2.7	14.3

[1] "Other" responses included: yearbook; drama; talent show preparation; and morning news.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-18

Percent of Schools Offering After-School Snack Programs, by School Type and District, SY 2000/01

School Type/District	Share of Schools N	Share of Schools Percent
School Type		
Control schools	73	49.3
Treatment schools	79	57.0
Classroom	18	72.2
Non-classroom	61	52.5
District		
A	16	93.8
B	24	50.0
C	9	88.9
D	34	26.5
E	59	52.5
F	10	60.0
All schools	152	53.3

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-19

Percent of Principals at Treatment Schools Who Report Involvement in District's Decision to Participate in Universal-Free School Breakfast Program and Reasons by District, SY 2000/01

School Type/District	Share of Principals Involved in Decision			Reason for Decision to Participate				
	N	Percent	N	Increase Program Participation	Provide Access to Nutritious Breakfast	Improve Academic Performance	Improve Student Behavior, Attendance, Tardiness	Other
				Percent of Those Principals Involved in Decision				
Treatment								
Classroom	18	27.8	5	40.0	80.0	20.0	20.0	20.0
Non-classroom	61	4.9	3	33.3	33.3	0.0	0.0	33.3
District								
A	8	37.5	3	33.3	100.0	0.0	0.0	0.0
B	12	0.0	0	--	--	--	--	--
C	5	0.0	0	--	--	--	--	--
D	17	5.9	1	0.0	0.0	0.0	0.0	100.0
E	32	9.4	3	66.7	66.7	33.3	33.3	0.0
F	5	20.0	1	0.0	0.0	0.0	0.0	100.0
All treatment schools	79	10.1	8	37.5	62.5	12.5	12.5	25.0

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-20

Nature of Principals' Involvement in Their Schools' School Breakfast Program in SY 2000/01, by School Type and District

School Type/District	N	Discussions with Other Principals	Working with Food Service Director	Working with Cafeteria Manager	Working with Teachers	Contact with Students/Parents	Promotional Activities	Other
					Percent			
School Type								
Control schools	73	60.3	41.1	82.2	24.7	37.0	45.2	2.7
Treatment schools	79	88.6**	74.7**	87.3	70.9**	55.7*	72.2**	1.3
Classroom	18	100.0	88.9	94.4	94.4	66.7	66.7	0.0
Non-classroom	61	85.2	70.5	85.2	63.9	52.5	73.8	1.6
District								
A	16	87.5	75.0	100.0	50.0	50.0	50.0	0.0
B	24	66.7	54.2	75.0	41.7	45.8	75.0	4.2
C	9	77.8	100.0	77.8	55.6	44.4	66.7	0.0
D	34	61.8	41.2	73.5	44.1	29.4	44.1	2.9
E	59	83.1	59.3	59.8	54.2	57.6	62.7	1.7
F	10	70.0	60.0	100.0	40.0	40.0	60.0	0.0
All schools	152	75.0	58.6	84.9	48.7	46.7	59.2	2.0

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-21

Principals' Perception of the Degree of Autonomy Their School Was Granted in Implementing the School Breakfast Program in SY 2000/01, by School Type and District

School Type/District	N	Full Autonomy	Substantial Autonomy	Partial Autonomy	Very Little Autonomy	No Autonomy	Don't Know
				Percent			
School Type							
Control schools	73	24.7	26.0	11.0	19.2	15.1	4.1
Treatment schools	78	34.6	37.2	17.9	6.4	3.8	0.0
Classroom	18	44.4	33.3	11.1	11.1	0.0	0.0
Non-classroom	60	31.7	38.3	20.0	5.0	5.0	0.0
District							
A	16	43.8	25.0	6.3	18.8	6.3	0.0
B	23	17.4	30.4	21.7	8.7	13.0	8.7
C	9	11.1	44.4	11.1	11.1	11.1	11.1
D	34	11.8	20.6	32.4	20.6	14.7	0.0
E	59	44.1	39.0	5.1	6.8	5.1	0.0
F	10	30.0	30.0	10.0	20.0	10.0	0.0
All schools	151	29.8	31.8	14.6	12.6	9.3	2.0

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-22

Responsibility for Specified Elements of the School Breakfast Program, as Reported by School Principals, by School Type, SY 2000/01

	Responsibility for Determining:											
	Menu				Where Breakfast Served				When Breakfast Served			
School Type/ District	N	School	District	Don't Know	N	School	District	Don't Know	N	School	District	Don't Know
		Percent				Percent				Percent		
School Type												
Control schools	73	1.4	97.3	1.4	73	94.5	5.5	0.0	73	90.4	9.6	0.0
Treatment schools	76	3.9	94.7	1.3	79	98.7	1.3	0.0	79	97.5	2.5	0.0
Classroom	18	5.6	88.9	5.6	18	94.4	5.6	0.0	18	100.0	0.0	0.0
Non-classroom	58	3.4	96.6	0.0	61	100.0	0.0	0.0	61	96.8	3.2	0.0
District												
A	16	6.3	93.8	0.0	16	100.0	0.0	0.0	16	100.0	0.0	0.0
B	24	0.0	95.8	4.2	24	100.0	0.0	0.0	24	95.8	4.2	0.0
C	9	0.0	100.0	0.0	9	100.0	0.0	0.0	9	88.9	11.1	0.0
D	31	6.5	93.5	0.0	34	91.2	8.8	0.0	34	85.3	14.7	0.0
E	59	1.7	98.3	0.0	59	100.0	0.0	0.0	59	98.3	1.7	0.0
F	10	0.0	100.0	10.0	10	80.0	20.0	0.0	10	90.0	10.0	0.0
All schools	149	2.7	96.0	1.3	152	96.7	3.3	0.0	152	94.1	5.9	0.0

Note: Row percentages sum to 100.0%.

Source: *Implementation Study - School Principal Interview, Spring 2001*

Exhibit A-23

Participants in School-Level Decision-Making Regarding the School Breakfast Program as Reported by School Principals, by School Type and District, SY 2000/01

School Type/District	N	Principal	Assistant Principal	Cafeteria Manager	Teachers	Custodians	Students	Others[1]
					Percent			
School Type								
Control schools	73	87.7	6.8	67.1	23.3	13.7	4.1	11.0
Treatment schools	79	98.7	7.6	73.4	65.8**	35.4**	5.1	17.7
Classroom	18	100.0	5.6	66.7	72.2	38.9	16.7	44.4
Non-classroom	61	98.4	8.2	75.4	63.9	34.4	1.6	9.8**
District								
A	16	100.0	6.3	62.5	50.0	0.0	0.0	12.5
B	24	91.7	4.2	79.2	37.5	33.3	4.2	16.7
C	9	88.9	0.0	77.8	55.6	33.3	0.0	11.1
D	34	82.4	2.9	67.6	47.1	14.7	0.0	0.0
E	59	98.3	11.9	69.5	50.8	35.6	8.5	20.3
F	10	100.0	10.0	70.0	10.0	10.0	10.0	30.0
All schools	152	93.4	7.2	70.4	45.4	25.0	4.6	14.5

[1] "Others" include administrative staff and SBPP liaisons.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

** Difference in proportions is statistically significant at the .01 level. Comparisons are between control and treatment schools and between classroom and non-classroom treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-24

Percent of Schools Indicating That Selected Considerations Were Important to School-Level Decisions Regarding the School Breakfast Program as Reported by School Principals, by School Type and District, SY 2000/01

		Considerations Important to SBP Decisions						
School Type/District	N	Teaching Time/Class Schedules	Space Limitations	Custodial Service/Clean Up	Bus Schedules	Food Preparation and Service	Breakfast Supervision	Other[1]
					Percent			
School Type								
Control schools	73	45.2	39.7	23.3	41.1	23.3	35.6	27.4
Treatment schools	79	62.0*	29.1	40.5*	31.6	44.3**	48.1	26.6
Classroom	18	66.7	50.0	55.6	44.4	50.0	61.1	16.7
Non-classroom	61	60.7	23.0*	36.1	27.9	42.6	44.3	29.5
District								
A	16	50.0	37.5	18.8	43.8	6.3	31.3	25.0
B	24	37.5	12.5	33.5	12.5	50.0	25.0	50.0
C	9	66.7	22.2	66.7	33.3	44.4	55.6	33.3
D	34	50.0	23.5	17.6	29.4	20.6	26.5	29.4
E	59	59.3	49.2	37.3	40.7	37.3	52.5	20.3
F	10	70.0	40.0	40.0	80.0	60.0	80.0	0.0
All schools	152	53.9	34.2	32.2	36.2	34.2	42.1	27.0

[1] "Other" responses included: security of students; menu/nutrition; parent notification; staffing; and paperwork/recordkeeping.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparisons are between control and treatment schools and between classroom and non-classroom treatment schools.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-25

Teacher Involvement in School Breakfast Program Decision-Making as Reported by School Principals, by School Type and District, SY 2000/01

School Type/ District	Share of Schools Reporting Teacher Involvement			How Teachers Involved				Concerns Cited by Teachers					
	N	Percent	N	Formal Committees	Informal Consultations	Consulted During Staff Meetings	Other[1]	Loss of Class Preparation Time	Additional Responsibility	Mess in Classroom	Precluded by Contract	Disruption to/Loss of Class Time	Other[2]
				Percent of Those Schools Reporting Teacher Involvement									
School Type													
Control	73	23.3	17	11.8	47.1	29.4	11.8	5.9	0.0	11.8	0.0	23.5	17.6
Treatment	79	65.8**	52	17.3	40.4	26.9	15.4	26.9	23.1	59.6	3.8	17.3	26.9
Classroom	18	72.2	13	15.4	53.8	7.7	23.1	30.8	38.5	84.6	15.4	7.7	23.1
Non-classroom	61	63.9	39	17.9	35.9	33.3	12.8	25.6	17.9	51.3	0.0	20.5	28.2
District													
A	16	50.0	8	12.5	50.0	12.5	25.0	0.0	25.0	50.0	0.0	0.0	37.5
B	24	37.5	9	0.0	33.3	55.6	11.1	11.1	33.3	66.7	0.0	33.3	22.2
C	9	55.6	5	20.0	40.0	40.0	0.0	20.0	0.0	40.0	0.0	20.0	40.0
D	34	47.1	16	25.0	53.8	25.0	6.3	25.0	0.0	18.8	0.0	31.3	12.5
E	59	50.8	30	16.7	43.3	23.3	16.7	30.0	23.3	56.7	6.7	13.3	26.7
F	10	10.0	1	0.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	0.8
All schools	152	45.4	69	15.9	42.0	27.5	14.5	21.7	17.4	47.8	2.9	18.8	24.6

[1] "Other" responses included: discussions at team meeting time; by survey; and through site council.

[2] "Other" responses included: possible reception by parents; late students; not enough time to eat; and lack of space.

Note: Row percentages ('How teachers involved') sum to 100.0%. Row percentages ('Concerns cited by teachers') may sum to more than 100.0% because of multiple responses.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-26

Percent of Principals Reporting That Training/Orientation Sessions Regarding the School Breakfast Program Were Held in Their Schools in SY 2000/01, by School Type and District

	Held Training/Orientation Sessions		Training/Orientation Session Attended by Principal or Representative	
School Type/District	N	Percent	N	Percent of Those That Held Sessions
School Type				
Control schools	73	53.4	39	84.6
Treatment schools	79	81.0**	64	98.4
Classroom	18	83.3	15	100.0
Non-classroom	61	80.3	49	98.0
District				
A	16	68.8	11	100.0
B	24	87.5	21	95.2
C	9	33.3	3	100.0
D	34	47.1	16	100.0
E	59	78.0	46	89.1
F	10	60.0	6	83.3
All schools	152	67.8	103	93.2

Note: Row percentages are independent.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-27

Perceived Changes in School Operations Associated with the School Breakfast Program in SY 2000/01 as Reported by School Principals, by School Type and District

School Type/District	N	Staffing					Transportation Schedule			Time Classes Begin				Instructional Time				Breakfast Supervision				
		No Chng.	Inc	Dec	DK	N/A	No Chng.	Chng.	N/A	No Chng.	Start Earlier	Start Later	N/A	No Chng.	Inc	Dec	N/A	No Chng.	Inc	Dec	N/A	DK
											Percent											
School Type																						
Control	73	87.7	5.5	1.4	4.1	1.4	91.8	5.5	2.7	97.3	1.4	0.0	1.4	98.6	0.0	0.0	1.4	84.9	12.3	0.0	1.4	1.4
Treatment	79	62.0*	36.7	0.0	1.3	0.0	97.5	2.5	0.0	93.7	1.3	5.1	0.0	88.6	2.5	8.9	0.0	39.2**	55.7**	3.8	0.0	1.3
Classroom	18	55.6	44.4	0.0	0.0	0.0	100.0	0.0	0.0	83.3	5.6	11.1	0.0	72.2	5.6	22.2	0.0	33.3	50.0	16.7	0.0	0.0
Non-classroom	61	63.9	34.4	0.0	0.0	1.6	96.7	3.3	0.0	96.7	0.0	3.3	0.0	93.4	1.6	4.9	0.0	41.0	57.4	0.0	0.0	1.6
District																						
A	16	56.3	37.5	0.0	0.0	6.3	87.5	6.3	6.3	87.5	6.3	0.0	6.3	87.5	6.3	0.0	6.3	31.3	62.5	0.0	6.3	0.0
B	24	83.3	8.3	4.2	4.2	0.0	95.8	0.0	4.2	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	58.3	33.3	4.2	0.0	4.2
C	9	77.8	22.2	0.0	0.0	0.0	100.0	0.0	0.0	88.9	11.1	0.0	0.0	88.9	11.1	0.0	0.0	66.7	33.3	0.0	0.0	0.0
D	34	94.1	5.9	0.0	0.0	0.0	100.0	0.0	0.0	97.1	0.0	2.9	0.0	97.1	0.0	2.9	0.0	91.2	8.8	0.0	0.0	0.0
E	59	64.4	33.9	0.0	1.7	0.0	93.2	6.8	0.0	94.9	0.0	5.1	0.0	89.8	0.0	10.2	0.0	50.8	47.5	0.0	0.0	1.7
F	10	70.0	10.0	0.0	20.0	0.0	90.0	10.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	70.0	10.0	20.0	0.0	0.0
All schools	152	74.3	21.7	0.7	2.6	0.7	94.7	3.9	1.3	95.4	1.3	2.6	0.7	93.4	1.3	4.6	0.7	61.2	34.9	2.0	0.7	1.3

Inc = Increase
Dec = Decrease
DK = Don't know

Note: Row percentages sum to 100.0%.

* Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-28

Perceived Changes in Staff Workload and/or Scheduling Requirements Due to Implementation of Universal-Free School Breakfasts in Treatment Schools as Reported by School Principals, by Staff Position and Breakfast Setting, SY 2000/01

		Workload and/or Scheduling Requirements				
Staff Position	N	Increased	Decreased	Did Not Change	Don't Know	Not Applicable
				Percent		
Teachers	77	29.9	0.0	70.1	0.0	0.0
Cafeteria workers	78	69.2	1.3	24.4	5.1	0.0
Office staff	78	42.3	2.6	55.1	0.0	0.0
Custodial staff	78	60.3	0.0	39.7	0.0	0.0
Bus drivers	76	1.3	0.0	96.1	0.0	2.6
Volunteers	65	6.2	0.0	76.9	0.0	16.9
Others	0	0.0	0.0	0.0	0.0	0.0

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-29

Perceived Changes in Staff Workload and/or Scheduling Requirements Due to Implementation of Universal-Free School Breakfasts in Treatment Schools as Reported by School Principals, by Staff Position and Breakfast Setting, SY 2000/01

		Workload and/or Scheduling Requirements				
Staff Position/ Breakfast Setting	**N**	**Increased**	**Decreased**	**Did Not Change**	**Don't Know**	**Not Applicable**
				Percent		
Teachers	77	29.9	0.0	70.1	0.0	0.0
Classroom	18	77.8	0.0	22.2	0.0	0.0
Non-classroom	59	15.3	0.0	84.7	0.0	0.0
Cafeteria workers	78	69.2	1.3	24.4	5.1	0.0
Classroom	18	72.2	5.6	16.7	5.6	0.0
Non-classroom	60	68.3	0.0	26.7	5.0	0.0
Office staff	78	42.3	2.6	55.1	0.0	0.0
Classroom	18	22.2	5.6	72.2	0.0	0.0
Non-classroom	60	48.3	1.7	50.0	0.0	0.0
Custodial staff	78	60.3	0.0	39.7	0.0	0.0
Classroom	18	66.7	0.0	33.3	0.0	0.0
Non-classroom	60	58.3	0.0	41.7	0.0	0.0
Bus drivers	76	1.3	0.0	96.1	0.0	2.6
Classroom	17	0.0	0.0	100.0	0.0	0.0
Non-classroom	59	1.7	0.0	94.9	0.0	3.4
Volunteers	65	6.2	0.0	76.9	0.0	16.9
Classroom	14	14.3	0.0	35.7	0.0	50.0
Non-classroom	51	3.9	0.0	88.2	0.0	7.8
Others	0	0.0	0.0	0.0	0.0	0.0
Classroom	0	0.0	0.0	0.0	0.0	0.0
Non-classroom	0	0.0	0.0	0.0	0.0	0.0

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-30

Perceived Changes in Administrative Reporting Requirements from Implementing Universal-Free School Breakfasts as Reported by Treatment School Principals, SY 2000/01

		Nature of Change			
	N	Increased	Decreased	No Change	Don't Know
		Percent			
Administrative reporting requirements	79	59.5	1.3	34.2	5.1
Effect on staff time	72	27.8	2.8	66.7	2.8

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-31

Perceived Changes in Administrative Reporting Requirements from Implementing Universal-Free School Breakfasts as Reported by Treatment School Principals, SY 2000/01

		Nature of Change			
	N	Increased	Decreased	No Change	Don't Know
			Percent		
Administrative reporting requirements	79	59.5	1.3	34.2	5.1
Classroom	18	38.9	5.6	55.6	0.0
Non-classroom	61	65.6*	27.9	0.0	6.6
Effect on staff time	72	27.8	2.8	66.7	2.8
Classroom	17	35.3	5.9	58.8	0.0
Non-classroom	55	25.5	1.8	69.1	3.6

Note: Row percentages sum to 100.0%.

* Difference in proportions is statistically significant at the .05 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-32

Perceived Changes in Selected Indicators of Student Behavior Between SY 1999/00 and SY 2000/01 as Reported by School Principals, by School Type and District

School Type/ District	N	Student Attitude and Overall Behavior				Rate of Tardiness				Rate of Attendance				Incidence of Disciplinary Problems				
		Improved	Became Worse	No Change	Don't Know/Not Applicable	Improved	Became Worse	No Change	Don't Know/Not Applicable	Improved	Became Worse	No Change	Don't Know/Not Applicable	N	Improved	Became Worse	No Change	Don't Know/Not Applicable
										Percent								
School Type																		
Control	73	27.4	2.7	67.1	2.8	12.3	5.5	78.1	4.1	12.3	2.7	78.1	6.9	73	28.8	5.5	60.3	5.5
Treatment	79	40.5	1.3	55.7	2.5	32.9**	11.4	48.1**	7.6	19.0	1.3	63.3*	16.5	78	32.1	3.8	59.0	5.1
Classroom	18	50.0	0.0	44.4	5.6	50.0	5.6	33.3	11.1	16.7	0.0	55.6	27.8	18	66.7	0.0	33.3	0.0
Non-classroom	61	37.7	1.6	59	5.6	27.9	13.1	52.5	6.6	19.7	1.6	65.6	13.1	60	21.7**	5.0	66.7*	6.7
District																		
A	16	62.5	0.0	25.0	12.6	25.0	6.3	56.3	12.6	12.5	12.5	56.3	18.8	16	37.5	6.3	43.8	12.6
B	24	37.5	4.2	58.3	0.0	29.2	8.3	54.2	8.3	16.7	0.0	66.7	16.7	23	34.8	4.3	56.5	4.3
C	9	44.4	0.0	55.6	0.0	0.0	11.1	77.8	11.1	0.0	11.1	66.7	22.2	9	22.2	11.1	66.7	0.0
D	34	11.8	0.0	85.3	2.9	8.8	5.9	79.4	5.9	11.8	0.0	82.4	5.9	34	11.8	0.0	82.4	5.9
E	59	37.3	3.4	57.6	1.7	27.1	11.9	57.6	3.4	22.0	0.0	66.1	11.9	59	37.3	6.8	52.5	3.4
F	10	30.0	0.0	70.0	0.0	50.0	0.0	50.0	0.0	10.0	0.0	90.0	0.0	10	40.0	0.0	50.0	10.0
All schools	152	34.2	2.0	61.2	2.7	23.0	8.6	62.5	6.0	15.8	2.0	70.4	11.9	15 1	30.5	4.6	59.6	5.3

Note: Row percentages sum to 100.0%.

* Difference in proportions is statistically significant at the .05 level. Comparisons are between control and treatment schools and between classroom and non-classroom treatment schools.

** Difference in proportions is statistically significant at the .01 level. Comparisons are between control and treatment schools and between classroom and non-classroom treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-33

Principals' Perception of a Stigma Associated with Participation in the School Breakfast Program by School Type and District, SY 2000/01

	Principals Indicating Stigma Associated with Participation in the SBP			
	Share of Total		Share Indicating Reduced Stigma in SY 2000/01	
School Type/District	N	Percent of Total	N	Percent of Those Indicating a Stigma
School Type				
Control schools	73	5.5	4	0.0
Treatment schools	79	16.5	13	69.2
Classroom	18	16.7	3	100.0
Non-classroom	61	16.4	10	60.0
District				
A	16	6.3	1	100.0
B	24	8.3	2	50.0
C	9	11.1	1	100.0
D	34	5.9	2	50.0
E	59	18.6	11	45.5
F	10	0.0	0	--
All schools	152	11.2	17	52.9

Note: Row percentages are independent.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-34

Percent of Principals by Their Perceptions of the Attitude of Major Stakeholders Toward Universal-Free School Breakfasts, Treatment Schools, SY 2000/01

		Perceived Attitude								
Stakeholders	N	Extremely Positive	Positive	Positive to Neutral	Neutral	Neutral to Negative	Negative	Extremely Negative	Don't Know	Not Applicable
						Percent				
Teachers	79	25.3	51.9	1.3	16.5	0.0	2.5	1.3	1.3	0.0
Administrators	79	34.2	50.6	0.0	8.9	0.0	5.1	1.3	0.0	0.0
School food workers	79	16.5	60.8	0.0	13.9	0.0	1.3	0.0	7.6	0.0
Students	79	20.3	67.1	0.0	12.7	0.0	0.0	0.0	0.0	0.0
Parents	79	27.8	58.2	0.0	11.4	1.3	0.0	0.0	1.3	0.0
Custodial staff	78	6.4	42.3	0.0	33.3	1.3	11.5	0.0	1.3	3.8

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-35

Percent of Principals by Their Perceptions of the Attitude of Major Stakeholders Toward Universal-Free School Breakfasts, Treatment Schools, SY 2000/01

Stakeholders	N	Perceived Attitude Extremely Positive	Positive	Positive to Neutral	Neutral	Neutral to Negative	Negative	Extremely Negative	Don't Know	Not Applicable
						Percent				
Teachers	79	25.3	51.9	1.3	16.5	0.0	2.5	1.3	1.3	0.0
Classroom	18	22.2	55.6	5.6	11.1	0.0	0.0	0.0	5.6	0.0
Non-classroom	61	26.2	50.8	0.0	18.0	0.0	3.3	1.6	0.0	0.0
Administrators	79	34.2	50.6	0.0	8.9	0.0	5.1	1.3	0.0	0.0
Classroom	18	50.0	38.9	0.0	11.1	0.0	0.0	0.0	0.0	0.0
Non-classroom	61	29.5	54.1	0.0	8.2	6.6	0.0	1.6	0.0	0.0
School food workers	79	16.5	60.8	0.0	13.9	0.0	1.3	0.0	7.6	0.0
Classroom	18	27.8	50.0	0.0	11.1	0.0	0.0	0.0	11.1	0.0
Non-classroom	61	13.1	63.9	0.0	14.8	0.0	1.6	0.0	6.6	0.0
Students	79	20.3	67.1	0.0	12.7	0.0	0.0	0.0	0.0	0.0
Classroom	18	38.9	50.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0
Non-classroom	61	14.8*	72.1	0.0	13.1	0.0	0.0	0.0	0.0	0.0
Parents	79	27.8	58.2	0.0	11.4	1.3	0.0	0.0	1.3	0.0
Classroom	18	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-classroom	61	21.3*	60.7	0.0	14.8	1.6	0.0	0.0	1.6	0.0
Custodial staff	79	6.4	42.3	0.0	33.3	1.3	11.5	0.0	1.3	3.8
Classroom	18	11.1	27.8	0.0	27.8	0.0	16.7	0.0	5.6	11.1
Non-classroom	60	5.0	46.7	0.0	35.0	1.7	10.0	0.0	0.0	1.7

Note: Row percentages sum to 100.0%.

*Difference in proportions is statistically significant at the .05 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-36

Percent of Principals by Their Perceptions of the Attitude of Major Stakeholders Toward the School Breakfast Program, Control Schools, SY 2000/01

		Perceived Attitude							
Stakeholders	N	Extremely Positive	Positive	Positive to Neutral	Neutral	Neutral to Negative	Negative	Extremely Negative	Don't Know
		Percent							
Teachers	73	19.2	54.8	1.4	20.5	2.7	0.0	0.0	1.4
Administrators	73	31.5	54.8	1.4	8.2	1.4	0.0	1.4	1.4
School food workers	73	21.9	71.2	1.4	4.1	0.0	0.0	0.0	1.4
Students	73	16.4	68.5	2.8	11.0	0.0	0.0	0.0	1.4
Parents	73	19.2	67.1	1.4	9.6	0.0	0.0	0.0	2.7
Custodial staff	72	5.6	54.2	1.4	34.7	0.0	1.4	0.0	2.8

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-37

Percent of Principals Indicating That They Anticipate Changes in How the School Breakfast Program Is Implemented in Their Schools in SY 2001/02, by School Type and District [1]

	Share of Principals Anticipating Change	
School Type/District	**N**	**Percent**
School Type		
Control schools	73	9.6
Treatment schools	79	21.5
Classroom	18	33.3
Non-classroom	61	18.0
District		
A	16	18.8
B	24	20.8
C	9	11.1
D	34	2.9
E	59	18.6
F	10	30.0
All schools	152	15.8

[1] Anticipated changes among control school principals included cafeteria staffing changes, scheduling changes, and adaptation to increased school enrollment. Among treatment schools, anticipated changes included changes in the breakfast setting (four anticipated moving from cafeteria to classroom while two anticipated at least a partial move in the opposite direction), staffing changes, schedule changes, and increased promotional efforts.

Source: Implementation Study - School Principal Interview, Spring 2001

Exhibit A-38

Major Ways in Which the School Breakfast Program is Publicized as Reported by School Principals, by School Type, SY 2000/01

School Type/District	N	Means of Publicizing Program: Announcements	Menu	Flyers	Newsletters	PTA/PTO Meetings	At Enrollment/ Registration	At Back-to-School Night Program	Student Handbook	Other[1]	Share Indicating Special Effort Made in SY 2000/01: N	Percent
						Percent						
School Type												
Control	73	1.4	6.8	9.6	39.7	1.4	9.6	4.1	5.5	9.6	73	12.3
Treatment	79	7.6	5.1	13.9	48.1	2.5	5.1	5.1	1.3	19.0	79	44.3
Classroom	18	11.1	0.0	22.2	38.9	5.6	5.6	11.1	0.0	5.6	18	27.8
Non-classroom	61	6.5	6.6	11.5	52.5	1.6	4.9	3.3	1.6	23.0	61	49.2
District												
A	16	6.3	6.3	12.5	50.0	6.3	0.0	12.5	0.0	12.5	16	25.0
B	24	4.2	0.0	8.3	50.0	0.0	12.5	0.0	8.3	20.8	24	29.2
C	9	0.0	0.0	0.0	55.6	0.0	0.0	11.1	11.1	11.1	9	22.2
D	34	2.9	8.8	8.8	50.0	0.0	2.9	0.0	5.9	5.9	34	23.5
E	59	5.1	8.5	18.6	40.7	1.7	10.2	3.4	0.0	20.3	59	35.6
F	10	10.0	0.0	0.0	10.0	10.0	10.0	20.0	0.0	0.0	10	20.0
All schools	152	4.6	5.9	11.8	44.1	2.0	7.2	4.6	3.3	14.5	152	28.9

[1] "Other" responses included: notices sent home with report cards; posters in school; mentioned at assemblies; by e-mail; on marquee; and through a phone tree.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study - School Principal Interview, Spring 2001

Cafeteria Manager

Exhibit A-39

Percent of Cafeteria Managers by Tenure in Present Position and by Years Experience with the School Breakfast Program, by School Type and District, SY 2000/01

		Tenure in Present Position				Years Experience with the SBP				
School Type/District	N	Median Years	Less than 3 Years	3 to 6 Years	More than 6 Years	Median	Less than 5	5 to 10	More than 10	Don't Know
				Percent				Percent		
School Type										
Control	74	6.0	24.3	33.8	41.9	7.0	25.7	47.3	21.6	5.4
Treatment	79	5.0	26.6	39.2	34.2	6.0	40.5	35.4	21.5	2.5
Classroom	18	4.0	38.9	27.8	33.3	5.0	44.4	27.8	22.2	5.6
Non-classroom	61	6.0	23.0	42.6	34.4	6.0	39.3	37.7	21.3	1.6
District										
A	16	4.5	18.8	37.5	43.8	10.0	6.3	62.5	31.3	0.0
B	24	6.0	8.3	50.0	41.7	10.5	0.0	45.8	45.8	8.3
C	10	3.0	30.0	40.0	30.0	3.0	70.0	20.0	0.0	10.0
D	34	6.0	17.6	38.2	44.1	8.5	20.6	38.2	35.3	5.9
E	59	4.0	39.0	32.2	28.8	4.0	55.9	39.0	3.4	1.7
F	10	7.5	20.0	20.0	60.0	7.0	30.0	40.0	30.0	0.0
All schools	153	5.5	25.5	36.6	37.9	7.0	33.3	41.2	21.6	3.9

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-40

Cafeteria Managers' Assessment of Their Overall Experience with the School Breakfast Program in Past Years, by School Type and District, SY 2000/01

School Type/District	Share Reporting Relatively Smooth Operation of the SBP N	Share Reporting Relatively Smooth Operation of the SBP Percent	N	Share That Had Encountered Problems of: Low Participation	Perceived as a Welfare Program	Scheduling Conflicts	Staffing Problems	Other[1]
						Percent[(1)]		
School Type								
Control	74	97.3	74	24.3	8.1	17.6	6.8	2.7
Treatment	79	98.7	79	30.4	10.1	7.6	11.4	6.3
Classroom	18	100.0	18	44.4	16.7	11.1	11.1	16.7
Non-classroom	61	98.4	61	26.2	8.2	6.6	11.5	3.3
District								
A	16	100.0	16	50.0	6.3	18.8	6.3	6.3
B	24	100.0	24	12.5	4.2	0.0	0.0	0.0
C	10	100.0	10	20.0	0.0	10.0	10.0	0.0
D	34	97.1	34	55.9	23.5	20.6	14.7	0.0
E	59	96.6	59	6.8	3.4	6.8	11.9	8.5
F	10	100.0	10	60.0	20.0	40.0	0.0	10.0
All schools	153	98.0	153	27.5	9.2	12.4	9.2	4.6

[1] "Other" responses included: unpredictable participation numbers, children's dislike of menu; food waste; and supervision.

Note: Some row percentages (1) do not sum to 100.0% because percentages represent only those cafeteria managers who encountered problems, while other row percentages sum to more than 100.0% because cafeteria managers indicated multiple problems.

Source: Implementation Study – Cafeteria Manager Interview, Spring 2001

Exhibit A-41

Percent of Cafeteria Managers Reporting Unusual Events That Affected Operation of the Cafeteria During School Years by School Type and District, 1999/00 or 2000/01

School Type/District	N	Unusual Events SY 1999/00	 SY 2000/01
		Percent	
School Type			
Control schools	74	2.7	4.1
Treatment schools	79	2.5	5.1
Classroom	18	5.6	16.7
Non-classroom	61	1.6	1.6
District			
A	16	0.0	6.3
B	24	8.3	12.5
C	10	10.0	10.0
D	34	0.0	0.0
E	59	0.0	0.0
F	10	10.0	20.0
All schools	153	2.6	4.6

Note: Row percentages are independent.

Source: *Implementation Study - Cafeteria Manager Interview, Spring 2001*

Exhibit A-42

Percent of Cafeteria Managers by the Tasks They Are Responsible for, by School Type and District, SY 2000/01

School Type/District	N	Cafeteria Manager Responsible for: Purchasing Food	Ordering Food	Menu Planning	Food Preparation	Serving	Record-keeping	Hiring Staff	Help with Hiring Staff	Other
		Percent								
School Type										
Control schools	74	21.6	70.3	4.1	74.3	86.5	77.0	12.2	10.8	4.1
Treatment schools	79	17.7	69.6	6.3	60.8	78.5	69.6	0.0	11.4	3.8
Classroom	18	38.9	83.3	11.1	66.7	72.2	66.7	0.0	22.2	0.0
Non-classroom	61	11.5**	65.6	4.9	59.0	80.3	70.5	0.0	8.2	4.9
District										
A	16	68.8	100.0	0.0	100.0	81.3	93.8	12.5	62.5	0.0
B	24	41.7	95.8	20.8	66.7	58.3	91.7	8.3	0.0	4.2
C	10	0.0	90.0	0.0	80.0	70.0	80.0	0.0	0.0	10.0
D	34	2.9	94.1	0.0	97.1	91.2	91.2	0.0	5.9	2.9
E	59	0.0	28.8	1.7	33.9	88.1	47.5	1.7	6.8	5.1
F	10	80.0	100.0	20.0	100.0	90.0	80.0	40.0	10.0	0.0
All schools	153	19.6	69.9	5.2	67.3	82.4	73.2	5.9	11.1	3.9

Note: Row percentage may sum to more than 100.0% because of multiple responses.

** Difference in proportions is statistically significant at the .01 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-43

Cafeteria Manager Participation in School Breakfast Program Training Programs During SY 2000/01 by School Type and District

School Type/ District	Share Taking Part in Training Program			Type of Training						Length of Training				Assessment						
	N	Percent	N	Intro. to Universal-Free	In-Service	Food Prep/ Safety	Meeting	Portion/ Reimbursable Meal	Other[1]	Less Than 2 Hours	2-3 Hours	More Than 3 Hours	Other	Excellent	Good	No Opinion	Poor	Wasted Time	Helpful/ Informative	Other
				Percent of Those Taking Part in Training Programs																
School Type																				
Control	74	31.1	23	21.7	34.8	17.4	17.4	21.7	21.7	21.7	47.8	21.7	21.7	0.0	82.6	4.3	4.3	0.0	17.4	8.7
Treatment	79	30.4	24	37.5	20.8	0.0	16.7	0.0	25.0	37.5	29.2	20.8	12.5	16.7	54.2	0.0	8.3	4.2	12.5	4.2
Classroom	18	38.9	7	0.0	28.6	0.0	14.3	0.0	57.1	0.0	57.1	28.6	14.3	14.3	71.4	0.0	0.0	0.0	14.3	0.0
Non-classroom	61	27.9	17	52.9	17.6	0.0	17.6	0.0	11.8	52.9	17.6	17.6	11.8	17.6	47.1	0.0	1.8	5.9	11.8	5.9
District																				
A	16	43.8	7	42.9	28.6	42.9	0.0	28.6	42.9	28.6	28.6	42.9	42.9	14.3	100.0	0.0	14.3	0.0	0.0	14.3
B	24	16.7	4	50.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0
C	10	20.0	2	0.0	50.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0
D	34	32.4	11	72.7	0.0	0.0	27.3	0.0	9.1	81.8	18.2	0.0	0.0	18.2	72.7	9.1	0.0	0.0	9.1	0.0
E	59	27.1	16	0.0	62.5	6.3	12.5	18.8	6.3	0.0	37.5	37.5	25.0	6.3	56.3	0.0	12.5	6.3	12.5	6.3
F	10	70.0	7	14.3	0.0	0.0	28.6	0.0	57.1	14.3	71.4	14.3	0.0	0.0	71.4	0.0	0.0	0.0	14.3	14.3
All schools	153	30.7	47	29.8	27.7	8.5	17.0	10.6	23.4	29.8	38.3	21.3	17.0	8.5	68.1	2.1	6.4	2.1	14.9	6.4

[1] "Other" responses included: computer training; classroom training; and refresher courses.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: *Implementation Study - Cafeteria Manager Interview, Spring 2001*

Exhibit A-44

Means of Publicizing the School Breakfast Program as Reported by Cafeteria Managers, by School Type and District, SY 2000/01

		Means of Publicizing SBP						Share Reporting Special Effort in SY 2000/01	
School Type/District	N	Menu	Fliers/ Posters	TV/ Newspaper/ Radio	Newsletter/ Calendar	Announcements/ Word of Mouth	Other[1]	N	Percent
		Percent							
School Type									
Control schools	74	66.2	21.6	4.1	25.7	6.8	14.9	74	20.3
Treatment schools	79	43.0	29.1	15.2	30.4	8.9	8.9	79	45.6
Classroom	18	27.8	27.8	16.7	27.8	5.6	5.6	17	38.9
Non-classroom	61	47.5	29.5	14.8	31.1	9.8	9.8	62	47.5
District									
A	16	62.5	18.8	25.0	12.5	6.3	62.5	16	50.0
B	24	29.2	25.0	0.0	58.3	4.2	12.5	24	20.8
C	10	50.0	20.0	10.0	10.0	0.0	10.0	10	40.0
D	34	64.7	35.3	8.8	41.2	11.8	2.9	64	47.1
E	59	62.7	25.4	11.9	15.3	10.2	6.8	59	23.7
F	10	20.0	10.0	0.0	30.0	0.0	0.0	10	40.0
All schools	153	54.2	25.5	9.8	28.1	7.8	12.4	153	33.3

[1] "Other" responses included: explanation in student handbook; phone messages; special events like grandparent breakfast; and giveaways.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-45

Location Where Breakfast is Served and Eaten, by School Type and District, SY 2000/01

School Type/ District	N	Location Served								Location Eaten								
		Cafeteria	Multi-purpose	Classroom	Gym	Cafeteria/ Gym	Kitchen	Some in Cafeteria/ Some in Classroom	Other[1]	Cafeteria	Multi-purpose	Classroom	Gym	Cafeteria/ Gym	Kitchen	Some in Cafeteria/ Some in Classroom	Hallway	Other[1]
		Percent								Percent								
School Type																		
Control	74	66.2	5.4	0.0	6.8	1.4	17.6	0.0	2.7	71.6	9.5	2.7	6.8	4.1	1.4	0.0	1.4	2.7
Treatment	79	62.0	6.3	12.7	6.3	5.1	2.5	1.3	3.8	51.9*	7.6	22.8	6.3	3.8	0.0	1.3	1.3	5.1
Classroom	18	38.9	0.0	50.0	5.6	5.6	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-classroom	61	68.9*	8.2	1.6	6.6	4.9	3.3	1.6	4.9	67.2	9.8	0.0	8.2	4.9	0.0	1.6	1.6	6.6
District																		
A	16	81.3	0.0	18.8	0.0	0.0	0.0	0.0	0.0	75.0	0.0	18.8	0.0	0.0	0.0	6.3	0.0	0.0
B	24	66.7	0.0	12.5	0.0	0.0	20.8	0.0	0.0	79.2	8.3	12.5	0.0	0.0	0.0	0.0	0.0	0.0
C	10	60.0	20.0	0.0	0.0	0.0	0.0	0.0	20.0	40.0	20.0	10.0	0.0	0.0	0.0	0.0	0.0	30.0
D	34	79.4	2.9	2.9	2.9	0.0	8.8	2.9	0.0	79.4	5.9	2.9	5.9	0.0	0.0	2.9	2.9	0.0
E	59	45.8	10.2	3.4	15.3	8.5	11.9	0.0	5.1	45.8	11.9	11.9	13.6	10.2	1.7	0.0	0.0	5.1
F	10	90.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
All schools	153	64.1	5.9	6.5	6.5	3.3	9.8	0.7	3.3	61.4	8.5	13.1	6.5	3.9	1.3	0.7	1.3	3.9

[1] "Other" responses included: auditorium; annex building; multi-purpose room and in classroom; gym and by office.

Note: Row percentages sum to 100.0%.

* Difference in proportions is statistically significant at the .05 level. Comparison is between classroom and non-classroom treatment schools.

Source: *Implementation Study - Cafeteria Manager Interview, Spring 2001*

Exhibit A-46

Percent of Schools Reporting That the Location Where Breakfast Was Served in SY 2000/01 Was Same as the Previous Year, by School Type and District

School Type/District	Same Location N	Percent
School Type		
Control schools	74	94.6
Treatment schools	79	86.1
Classroom	18	61.1
Non-classroom	61	93.4
District		
A	16	68.8
B	24	87.5
C	10	80.0
D	34	97.1
E	59	93.2
F	10	100.0
All schools	153	90.2

Source: Implementation Study – Cafeteria Manager Interview, Spring 2001

Exhibit A-47

Percent of Schools by Staff Providing Supervision of Children During Breakfast Service, by School Type and District, SY 2000/01

		Supervisory Staff									Schools With Change in Supervision Staff in SY 2000/01		Schools With Supervision Problems	
School Type/District	N	Food Service Staff	Teachers	Teacher Assistants/ Paraeducators	Custodian	Parent Volunteers/ Volunteers	Principal/ Assistant Principal	Aides	Office Staff/ Secretary	Others [1]	N	Percent	N	Percent
		Percent												
School Type														
Control	74	33.8	36.5	23.0	13.5	2.7	12.2	8.1	0.0	21.6	74	16.2	74	10.8
Treatment	79	38.0	40.5	17.7	20.3	5.1	5.1	7.6	5.1	22.8	79	34.2*	79	11.4
Classroom	18	16.7	88.9	5.6	0.0	5.6	0.0	5.6	0.0	5.6	18	66.7	17	5.6
Non-classroom	61	44.3	26.2	21.3	26.2	4.9	6.6	8.2	6.6	27.9	61	24.6**	62	13.1
District														
A	16	18.8	81.3	31.3	6.3	0.0	18.8	0.0	0.0	6.3	16	37.5	16	18.8
B	24	16.7	20.8	37.5	0.0	0.0	4.2	20.8	0.0	33.3	24	12.5	24	8.3
C	10	60.0	40.0	10.0	10.0	10.0	0.0	0.0	0.0	40.0	10	10.0	10	20.0
D	34	44.1	5.9	14.7	35.3	0.0	5.9	5.9	2.9	20.6	34	17.6	34	17.6
E	59	42.4	42.4	15.3	20.3	8.5	10.2	8.5	5.1	23.7	59	28.8	59	6.8
F	10	20.0	100.0	20.0	0.0	0.0	10.0	0.0	0.0	0.0	10	60.0	10	0.0
All schools	153	35.9	38.6	20.3	17.0	3.9	8.5	7.8	2.6	22.2	153	25.5	153	11.1

[1] "Others" include: school counselor; liaison; and a person hired just to provide supervision.

Note: Row percentages may sum to more than 100.0% because of multiple responses.

* Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.

** Difference in proportions is statistically significant at the .01 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-48

Percent of Schools Serving Breakfast in the Classroom by Persons Responsible for Specified Tasks, SY 2000/01

Task	N[1]	Food Service Staff	Students	Teachers	Custodians	F/S Staff and Custodian	F/S Staff and Teachers	Others
				Percent of Those Schools Serving in Classroom				
Food delivery	20	25.0	70.0	5.0	0.0	0.0	0.0	0.0
Serving food	20	0.0	55.0	5.0	0.0	0.0	0.0	5.0
Trash removal	20	15.0	0.0	10.0	65.0	5.0	0.0	0.0
Record keeping	20	15.0	0.0	20.0	0.0	0.0	30.0	5.0

[1] Includes 18 treatment schools and 2 control schools.

Note: Row percentages do not always sum to 100.0% because of non-response.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-49

Percent of Schools Serving Breakfast in the Classroom by Types of Problems Encountered, SY 2000/01

Type of Problem	N[1]	Percent of Those Schools Serving in Classrooms
Have had problems serving in classroom	20	45.0
Have had problems due to:		
Lack of help delivering food to rooms	20	5.0
Not keeping food warm	20	10.0
Trash removal	20	20.0
Cleaning up spillage	20	30.0
Teacher resistance	20	10.0
Poor record keeping	20	5.0
Other issues[2]	20	10.0

[1] Includes 18 treatment schools and 2 control schools.

[2] "Other issues" included distraction in classroom, and difficulty keeping food cold.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-50

Percent of Schools by Time Allotted for Breakfast Service, Whether Part of School Day, Initiative Required by Students to Eat School Breakfast, by School Type and District, SY 2000/01

		Time Allotted for Breakfast Service							Breakfast Treated as Part of School Day			Initiative Required to Eat School Breakfast When Breakfast is Not Treated As Part of School Day				
School Type/District	N	Median Minutes	Less than 15 Min.	15 to 20 Min.	21 to 30 Min.	More than 30 Min.	Varies	Don't Know	N	Percent	N	Significant	Moderate	Little	None	Don't Know
			Percent									Percent				
School Type																
Control	74	30.0	0.0	18.9	45.9	33.8	0.0	1.4	74	4.1	71	9.9	19.7	21.1	42.3	7.0
Treatment	79	30.0	1.3	15.2	36.7	43.0	3.8	0.0	79	10.1	68	5.9	16.2	30.9	44.1	2.9
Classroom	18	30.0	5.6	27.8	22.2	33.3	11.1	0.0	18	33.3	10	0.0	0.0	10.0	80.0	10.0
Non-classroom	61	30.0	0.0	11.5	41.0	45.9	1.6	0.0	61	3.3	58	6.9	19.0	34.5	37.9	1.7
District																
A	16	40.0	0.0	0.0	12.5	81.3	6.3	0.0	16	6.3	15	13.3	6.7	40.0	40.0	0.0
B	24	27.5	4.2	16.7	54.2	25.0	0.0	0.0	24	8.3	22	18.2	40.9	9.1	22.7	9.1
C	10	30.0	0.0	40.0	20.0	30.0	0.0	10.0	10	20.0	7	14.3	14.3	71.4	0.0	0.0
D	34	30.0	0.0	17.6	44.1	35.3	2.9	0.0	34	0.0	33	6.1	18.2	27.3	42.4	6.1
E	59	30.0	0.0	20.3	42.4	35.6	1.7	0.0	59	10.2	53	3.8	13.2	22.6	54.7	5.7
F	10	30.0	0.0	0.0	60.0	40.0	0.0	0.0	10	10.0	9	0.0	11.1	22.2	66.7	0.0
All schools	153	30.0	0.7	17.0	41.2	38.6	2.0	0.7	153	7.8	139	7.9	18.0	25.9	43.2	5.0

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-51

Percent of Schools by Selected Characteristics of the Meals Served, by School Type and District, SY 2000/01

School Type/District	N	Identical Breakfast Served to All	Offer Versus Serve Available	A la Carte Offered	A la Carte Foods Offered					Hot Meals Served		Frequency with Which Hot Meals Were Offered							
					N	Milk	Juice	Entrée	Other[1]	N	%	N	2 Times A Week During Cold Weather	Everyday During Cold Weather	1-2 Times A Month	1-2 Times A Week	3-4 Times A Week	Every-Day	Other[2]
		Percent(1)				Percent of Those Schools Offering A la Carte(2)							Percent of Those Schools Offering Hot Meals(3)						
School Type																			
Control	74	97.3	82.4	50.0	37	86.5	75.7	32.4	21.6	74	60.8	45	4.4	0.0	2.2	8.9	13.3	55.6	15.6
Treatment	79	92.4	68.4*	32.9*	26	96.2	80.8	50.0	3.8	79	59.5	47	4.3	2.1	10.6	14.9	14.9	46.8	6.4
Classroom	18	83.3	33.3	11.1	2	100.0	100.0	0.0	0.0	18	72.2	13	0.0	0.0	7.7	23.1	15.4	38.5	15.4
Non-classroom	61	95.1	78.7**	39.3	24	95.8	79.2	54.2	4.2	61	55.7	34	5.9	2.9	11.8	11.8	14.7	50.0	2.9
District																			
A	16	93.8	81.3	43.8	7	100.0	100.0	71.4	42.9	16	100.0	16	0.0	0.0	0.0	6.3	18.8	68.8	6.3
B	24	100.0	95.8	29.2	7	57.1	57.1	42.9	28.6	24	100.0	24	0.0	0.0	0.0	8.3	8.3	70.8	12.5
C	10	90.0	90.0	70.0	7	85.7	85.7	71.4	14.3	10	60.0	6	0.0	0.0	0.0	0.0	0.0	66.7	33.3
D	34	97.1	97.1	82.4	28	96.4	85.7	39.3	10.7	34	38.2	13	30.8	7.7	0.0	7.7	0.0	38.5	15.4
E	59	93.2	59.3	20.3	12	91.7	50.0	8.3	0.0	59	39.0	23	0.0	0.0	26.1	30.4	17.4	21.7	4.3
F	10	90.0	20.0	20.0	2	100.0	100.0	0.0	0.0	10	100.0	10	0.0	0.0	0.0	0.0	40.0	50.0	10.0
All schools	153	94.8	75.2	41.2	63	90.5	77.8	39.7	14.3	153	60.1	92	4.3	1.1	6.5	12.0	14.1	51.1	10.9

[1] "Other" responses included: fruit; toast; Pop Tart; and sausage.

[2] "Other" responses included: burritos everyday from February until April, and oatmeal every so often.

Note: Row percentages (1) are independent. Row percentages (2) may sum to 100.0% because of multiple responses. Row percentages (3) sum to 100.0%.

- * Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.
- ** Difference in proportions is statistically significant at the .01 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-52

Percent of Schools Reporting that Composition of School Breakfasts Changed During SY 2000/01 and Nature of Change, by School Type and District

School Type/District	Change in Breakfast Composition		Nature of Change						
	N	Percent	N	More Prepackaged Items	More/ New Items Offered	Fewer Items Offered	Not as Many Hot Items	Variety of Items Replaced Cereal and Toast	Other[1]
				Percent of Those Schools Reporting Change in Composition					
School Type									
Control	74	10.8	8	0.0	12.5	25.0	12.5	0.0	37.5
Treatment	79	27.8**	22	18.2	22.7	13.6	13.6	18.2	27.3
Classroom	18	38.9	7	28.6	14.3	42.9	14.3	0.0	0.0
Non-classroom	61	24.6	15	13.3	26.7	0.0	13.3	20.0	40.0
District									
A	16	31.3	5	60.0	0.0	20.0	0.0	0.0	20.0
B	24	25.0	6	0.0	16.7	33.3	33.3	0.0	0.0
C	10	50.0	5	0.0	60.0	0.0	0.0	0.0	60.0
D	34	11.8	4	0.0	0.0	0.0	0.0	75.0	50.0
E	59	13.6	8	12.5	12.5	12.5	25.0	0.0	37.5
F	10	20.0	2	0.0	50.0	50.0	0.0	0.0	0.0
All schools	153	19.6	20	13.3	20.0	16.7	13.3	10.0	30.0

[1] "Other" responses included: the substitution of new products; experimentation with menus in response to student acceptance; and changes designed to make meals more nutritious.

Note: Some row percentages do not sum to 100.0% because of non-response, while other row percentages may sum to more than 100.0% because of multiple responses.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-53

Percent of Schools with Foods Available from Other On-Campus Sources During Periods of Breakfast Service, by School Type and District, SY 2000/01

School Type/District	Foods Available From Other Sources N	Foods Available From Other Sources Percent	N	Types of Foods Available: Juice	Candy/ Chips/Cookies	Snacks	Soda
				Percent of Those Schools With Food From Other Sources			
School Type							
Control schools	74	12.2	9	77.8	22.2	44.4	11.1
Treatment schools	79	15.2	12	75.0	8.3	0.0	33.3
Classroom	18	16.7	3	33.3	0.0	0.0	100.0
Non-classroom	61	14.8	9	88.9	11.1	0.0	11.1
District							
A	16	6.3	1	0.0	0.0	0.0	100.0
B	24	0.0	0	0.0	0.0	0.0	0.0
C	10	0.0	0	0.0	0.0	0.0	0.0
D	34	47.1	16	93.8	12.5	18.8	18.8
E	59	1.7	1	100.0	100.0	0.0	0.0
F	10	30.0	3	0.0	0.0	0.0	66.7
All schools	153	13.7	21	76.2	14.3	19.0	23.8

Note: Some row percentages do not sum to 100.0% because of non-response, while other row percentages can sum to more than 100.0% because of multiple responses.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-54

Percent of Treatment Schools Reporting Operational Changes Associated with Implementation of Universal-Free School Breakfasts, by Breakfast Setting and District, SY 2000/01

Breakfast Setting/ District	N	Change in Cafeteria Staff Workload	Hired Additional Staff	Changes in Preparation Site	Change in Staff/Methods of Preparation	Additional Expenditure Incurred	Change in Time of Service	Changes in Reporting Requirements
		Percent of Treatment Schools						
Breakfast Setting								
Classroom	18	88.9	38.9	5.6	66.7	66.7	27.8	27.8
Non-classroom	61	50.8	18.0	4.9	19.7**	24.6**	24.6	16.4
District								
A	8	87.5	37.5	0.0	37.5	50.0	25.0	25.0
B	12	58.3	8.3	0.0	25.0	33.3	33.3	25.0
C	5	60.0	20.0	0.0	20.0	20.0	40.0	20.0
D	17	52.9	5.9	0.0	29.4	17.6	47.1	5.9
E	32	50.0	31.3	9.4	25.0	31.3	12.5	25.0
F	5	100.0	40.0	20.0	80.0	100.0	0.0	0.0
All treatment schools	79	59.5	22.8	5.1	30.4	34.2	25.3	19.0

Note: Row percentages may sum to more than 100.0% because of multiple responses.

** Difference in proportion is statistically significant at the .01 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-55

Role of Volunteers/Teacher Aides Assisting in Breakfast Service in Treatment Schools, by Breakfast Setting and District, SY 2000/01

	Percent of Schools Reporting Use of Volunteers/Aides		For Schools Using Volunteers/Aides, Median Hours/Week	
Breakfast Setting/District	**N**	**Percent**	**N**	**Hours**
Breakfast Setting				
Classroom	18	16.7	2	5.00
Non-classroom	61	34.4	17	3.46
District				
A	8	37.5	2	5.00
B	12	41.7	5	2.75
C	5	60.0	2	2.75
D	17	11.8	1	3.25
E	32	34.4	9	2.50
F	5	0.0	0	–
All treatment schools	79	30.4	19	2.75

Note: Not all schools that reported use of volunteers/aides provided median hours/week data.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-56

Location of Breakfast Preparation in Treatment Schools

Breakfast Setting/District	N	School Cafeteria	Central Kitchen	Outside Vendor	Combination	Food Service Center	Other
				Percent			
Breakfast setting							
Classroom	18	66.1	22.2	11.1	0.0	0.0	5.6
Non-classroom	61	31.1**	41.0	4.9	3.3	11.5	8.2
District							
A	8	75.0	25.0	0.0	0.0	0.0	0.0
B	12	100.0	0.0	0.0	0.0	0.0	0.0
C	5	20.0	40.0	0.0	20.0	0.0	20.0
D	17	29.4	64.7	0.0	0.0	0.0	5.9
E	32	3.1	43.8	15.6	3.1	21.9	12.5
F	5	100.0	0.0	0.0	0.0	0.0	0.0
All treatment schools	79	38.0	36.7	6.3	2.5	8.9	7.6

Note: Row percentages sum to 100.0%.

** Difference in proportions is statistically significant at the .01 level. Comparison is between classroom and non-classroom treatment schools.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-57

Perception of Cafeteria Managers in Treatment Schools of Student Attitude Toward Breakfast Program as Result of Universal-Free School Breakfasts, by Breakfast Setting and District, SY 2000/01

Breakfast Setting/District	N	Substantially More Positive	More Positive	No Change in Attitude	More Negative	Substantially More Negative	Don't Know
				Percent of Treatment Schools			
Breakfast Setting							
Classroom	18	5.6	66.7	22.2	0.0	0.0	5.6
Non-classroom	61	8.2	47.5	27.9	1.6	0.0	14.8
District							
A	8	0.0	62.5	25.0	0.0	0.0	12.5
B	12	0.0	41.7	33.3	0.0	0.0	25.0
C	5	40.0	20.0	40.0	0.0	0.0	0.0
D	17	11.8	64.7	5.9	5.9	0.0	11.8
E	32	6.3	43.8	37.5	0.0	0.0	12.5
F	5	0.0	100.0	0.0	0.0	0.0	0.0
All treatment schools	79	7.6	51.9	26.6	1.3	0.0	12.7

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-58

Perception of Cafeteria Managers of Change in Relative Magnitude of Breakfast Plate Waste Between SY 1999/00 and SY 2000/01, by School Type and District

School Type/District	N	Plate Waste Increased	 Decreased	 Didn't Change	 Don't Know
		Percent			
School Type					
Control	74	1.4	4.1	86.5	8.1
Treatment	79	17.7	8.9	67.1**	6.3
Classroom	18	27.8	11.1	44.4	16.7
Non-classroom	61	14.8	8.2	73.8	3.3
District					
A	16	12.5	18.8	68.8	0.0
B	24	4.2	8.3	83.3	4.2
C	10	20.0	0.0	70.0	10.0
D	34	8.8	0.0	85.3	5.9
E	59	11.9	6.8	71.2	10.2
F	10	0.0	10.0	80.0	10.0
All schools	153	9.8	6.5	76.5	7.2

Note: Row percentages sum to 100.0%.

** Difference in proportions is statistically significant at the .01 level. Comparison is between control and treatment schools.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-59

Perception of School Cafeteria Managers of the Attitude of Cafeteria Staff in SY 2000/01 Toward the SBP, by School Type and District

		Attitude of Staff In SY 2000/01				
School Type/District	**N**	**Very Positive**	**Positive**	**Neutral**	**Negative**	**Very Negative**
				Percent(1)		
School Type						
Control	74	39.2	47.3	12.2	0.0	0.0
Treatment	79	31.6	46.8	19.0	2.5	0.0
Classroom	18	27.8	38.9	27.8	5.6	0.0
Non-classroom	61	32.8	49.2	16.4	1.6	0.0
District						
A	16	25.0	43.8	25.0	6.3	0.0
B	24	58.3	37.5	4.2	0.0	0.0
C	10	30.0	70.0	0.0	0.0	0.0
D	34	38.2	47.1	11.8	0.0	0.0
E	59	30.5	44.1	23.7	1.7	0.0
F	10	20.0	70.0	10.0	0.0	0.0
All schools	153	35.3	47.1	15.7	1.3	0.0

Note: Row percentages (1) do not always sum to 100.0% because of non-response.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-60

Perceptions of Cafeteria Manager Changes in Attitude of Cafeteria Staff Toward the SBP from SY 1999/00 to SY 2000/01, by School Type and District

	Control Schools					Share Reporting Change in Attitude		Treatment Schools					
		Change in Attitude from Previous Year							Change in Attitude from Previous Year				
School Type/District	N	More Positive	More Negative	Unchanged	Don't Know	N	Percent	N	Much More Positive	More Positive	Neutral	More Negative	Much More Negative
		Percent							Percent				
School Type													
Classroom	na	na	na	na	na	18	61.1	11	18.2	54.5	0.0	27.3	0.0
Non-classroom	na	na	na	na	na	61	19.7**	12	8.3	83.3	0.0	8.3	0.0
District													
A	8	12.5	0.0	62.5	0.0	8	50.0	4	0.0	75.0	0.0	25.0	0.0
B	12	16.7	0.0	83.3	0.0	12	33.3	4	0.0	75.0	0.0	25.0	0.0
C	5	0.0	20.0	60.0	20.0	5	40.0	2	0.0	100.0	0.0	0.0	0.0
D	17	5.9	0.0	88.2	0.0	17	17.6	3	33.3	66.7	0.0	0.0	0.0
E	27	0.0	0.0	96.3	3.7	32	18.8	6	16.7	50.0	0.0	33.3	0.0
F	5	0.0	0.0	100.0	0.0	5	80.0	4	25.0	75.0	0.0	0.0	0.0
All schools	74	5.4	1.4	86.5	2.7	79	29.1	23	13.0	69.6	0.0	17.4	0.0

na = not applicable

Note: Row percentages do not always sum to 100.0% because of non-response.

** Difference in proportions is statistically significant at the .01 level. Comparison is between classroom and non-classroom treatment schools.

Source: *Implementation Study - Cafeteria Manager Interview, Spring 2001*

Exhibit A-61

Cafeteria Manager Perceptions That There Will Be Changes in How the School Breakfast Program Is Implemented in the Next School Year, by School Type and District, SY 2000/01

School Type/District	N	Share Indicating Changes Anticipated Yes	 Don't Know
		Percent	
School Type			
Control schools	74	21.6	2.7
Treatment schools	79	20.3	2.5
Classroom	18	27.8	0.0
Non-classroom	61	18.0	3.3
District			
A	16	37.5	0.0
B	24	4.2	8.3
C	10	10.0	0.0
D	34	8.8	0.0
E	59	30.5	3.4
F	10	30.0	0.0
All schools	153	20.9	2.6

Note: Row percentages would sum to 100.0% if "no" percentages were listed.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Exhibit A-62

Percent of Control Schools by Nature of Changes in SBP in SY 2000/01, by District

		Workload of Cafeteria Staff				Breakfast Preparation Time				Serving Time				Administrative Reporting Requirements				Student Attitude Toward SBP			
District	N	Increase	Decrease	No Change	Don't Know	Increase	Decrease	No Change	Don't Know	Increase	Decrease	No Change	Don't Know	Increase	Decrease	No Change	Don't Know	More Positive	More Negative	No Change	Don't Know
										Percent Of Control Schools											
A	8	12.5	25.0	62.5	0.0	25.0	12.5	62.5	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	50.0	0.0	50.0	0.0
B	12	8.3	0.0	91.7	0.0	8.3	0.0	91.7	0.0	8.3	0.0	91.7	0.0	8.3	0.0	91.7	0.0	8.3	0.0	91.7	0.0
C	5	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	20.0	0.0	80.0	0.0
D	17	23.5	0.0	76.5	0.0	23.5	0.0	76.5	0.0	11.8	5.9	82.4	0.0	5.9	0.0	94.1	0.0	23.5	0.0	70.6	5.9
E	27	14.8	0.0	81.5	3.7	7.4	0.0	88.9	3.7	7.4	0.0	88.9	3.7	0.0	0.0	92.6	7.4	14.8	0.0	77.8	7.4
F	5	20.0	20.0	60.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	40.0	0.0	60.0	0.0
All control schools	74	14.9	4.1	79.7	1.4	12.2	1.4	85.1	1.4	6.8	1.4	90.5	1.4	2.7	0.0	94.6	2.7	21.6	0.0	74.3	4.1

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Cafeteria Manager Interview, Spring 2001

Teacher

Exhibit A-63

Teacher Attitude Toward School Meals and Toward Breakfast, by School Type and District, SY 2000/01

		Effect of School Meals on Learning				Importance of Breakfast in Preparing Child to Learn				
School Type/District	N	Contributes	Distracts	No Effect	Don't Know	Very Important	Important	Slightly Important	Unimportant	No Opinion
		Percent				Percent				
School Type										
Control	18	88.9	0.0	0.0	11.1	88.9	5.6	5.6	0.0	0.0
Treatment	36	88.9	0.0	8.3	2.8	88.9	5.6	2.8	0.0	2.8
Classroom	15	100.0	0.0	0.0	0.0	86.7	6.7	0.0	0.0	6.7
Non-classroom	21	81.0	0.0	14.3	4.8	90.5	4.8	4.8	0.0	0.0
District										
A	9	100.0	0.0	0.0	0.0	88.9	11.1	0.0	0.0	0.0
B	9	100.0	0.0	0.0	0.0	44.4	22.2	22.2	0.0	11.1
C	9	77.8	0.0	11.1	11.1	100.0	0.0	0.0	0.0	0.0
D	9	88.9	0.0	0.0	11.1	100.0	0.0	0.0	0.0	0.0
E	9	77.8	0.0	22.2	0.0	100.0	0.0	0.0	0.0	0.0
F	9	88.9	0.0	0.0	11.1	100.0	0.0	0.0	0.0	0.0
All schools	54	88.9	0.0	5.6	5.6	88.9	5.6	3.7	0.0	1.9

Note: Row percentages sum to 100.0%.

Source : Implementation Study - Teacher Interview, Spring 2001

Exhibit A-64

Operational Features of Serving Breakfast in the Classroom, by District, SY 2000/01

		Time of Day		Average Time Allotted		Time Used for the Other Things		
District	N	Part of School Day	Precedes School Day	N	Min	N	Yes	No
		Percent					Percent	
A	3	0.0	100.0	3	34	3	100.0	0.0
B	3	66.7	33.3	3	15	3	100.0	0.0
C	1	100.0	0.0	1	15	1	100.0	0.0
D	0	–	–	0	–	0	--	--
E	3	100.0	0.0	3	18	3	100.0	0.0
F	6	0.0	100.0	5	33	6	100.0	0.0
All schools	16	37.5	62.5	15	25	16	100.0	0.0

Notes: Breakfast was neither served nor eaten in the classroom of any of the teachers interviewed in District D.
Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-65

Role of Teachers in Classrooms Where Breakfast Is Eaten in the Classroom, by District, SY 2000/01

		Serving			Cleaning-Up			Record-Keeping		
District	N	Major	Minor	None	Major	Minor	None	Major	Minor	None
						Percent				
A	3	0.0	0.0	100.0	0.0	0.0	100.0	100.0	0.0	0.0
B	3	0.0	33.3	66.7	0.0	33.3	66.7	33.3	66.7	0.0
C	1	0.0	0.0	100.0	0.0	0.0	100.0	0.0	100.0	0.0
D	0	--	--	--	--	--	--	--	--	--
E	3	0.0	0.0	100.0	0.0	0.0	100.0	33.3	66.7	0.0
F	6	0.0	0.0	100.0	16.7	66.7	16.7	33.3	66.7	0.0
All schools	16	0.0	6.3	93.8	6.3	31.3	62.5	43.8	56.3	0.0

Notes: Breakfast was neither served nor eaten in the classroom of any of the teachers interviewed in District D.
Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-66

Effect of Serving Breakfast in the Classroom on Teacher Preparation and Instruction Time, by District, SY 2000/01

District	N	Effect on Classroom Preparation Time			Effect On Classroom Instruction Time		
		Major Reduction	Minor Reduction	Little or No Effect	Major Reduction	Minor Reduction	Little or No Effect
			Percent			Percent	
A	3	0.0	33.3	66.7	0.0	33.3	66.7
B	3	0.0	33.3	66.7	0.0	33.3	66.7
C	1	0.0	0.0	100.0	0.0	0.0	100.0
D	0	–	–	–	–	–	–
E	3	0.0	0.0	100.0	0.0	33.3	66.7
F	6	16.7	33.3	50.0	16.7	0.0	83.3
All schools	16	6.3	25.0	68.8	6.3	18.8	75.0

Notes: Breakfast was neither served nor eaten in the classroom of any of the teachers interviewed in District D.
Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-67

Overall Opinion of Serving/Eating Breakfast in the Classroom of Participating Teachers, by District, SY 2000/01

District	N	Very Positive	Positive	Neutral	Negative	Very Negative
				Percent		
A	3	33.3	33.3	0.0	33.3	0.0
B	3	66.7	33.3	0.0	0.0	0.0
C	1	100.0	0.0	0.0	0.0	0.0
D	0	–	–	–	–	–
E	3	33.3	66.7	0.0	0.0	0.0
F	6	16.7	0.0	50.0	0.0	33.3
All schools	16	37.5	25.0	18.8	6.3	12.5

Notes: Breakfast was neither served nor eaten in the classroom of any of the teachers interviewed in District D.
Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-68

Problems Associated with Serving Breakfast in the Classroom as Reported by Teachers, by District, SY 2000/01

District	N	Spillage		Trash Removal	Less Class Time	Time Required for Record-Keeping	Other[1]
		Major	Minor				
		Percent(1)		Percent(2)			
A	3	0.0	100.0	33.3	33.3	0.0	33.3
B	3	0.0	66.7	0.0	0.0	0.0	33.3
C	1	0.0	100.0	100.0	0.0	0.0	100.0
D	0	–	–	–	–	–	–
E	3	0.0	66.7	0.0	0.0	0.0	66.7
F	6	0.0	66.7	33.3	16.7	16.7	33.3
All schools	16	0.0	75.0	25.0	12.5	6.3	43.8

[1] "Other" responses included: getting into a routine; fights over extras; food left in desks; and convenience foods not as nourishing.

Notes: Breakfast was neither served nor eaten in the classroom of any of the teachers interviewed in District D. Row percentages (1) do not always sum to 100.0% because of non-response. Some row percentages (2) do not sum to 100.0% because of non-response, while other row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-69

Attitude Toward Serving Breakfast in the Classroom by Teachers Who Have Not Done It, by School Type and District, SY 2000/01

School Type/District	N	Strongly Supportive	Supportive	Neutral	Opposed	Strongly Opposed
				Percent		
School Type						
Control	18	16.7	0.0	11.1	44.4	27.8
Treatment	20	0.0	20.0	10.0	40.0	30.0
District						
A	6	0.0	0.0	16.7	66.7	16.7
B	6	0.0	0.0	16.7	16.7	66.7
C	8	0.0	0.0	0.0	62.5	37.5
D	9	0.0	44.4	11.1	22.2	22.2
E	6	16.7	0.0	16.7	50.0	16.7
F	3	66.7	0.0	0.0	33.3	0.0
All schools	38	7.9	10.5	10.5	42.1	28.9

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-70

Teacher Perceptions of Stigma Associated with Eating School Breakfasts, by School Type and District, SY 2000/01

School Type/District	Share of Total that Noticed a Stigma		Share of Those Noticing a Change in Stigma in SY2000/01		Nature of Change			
	N	Percent	N	Percent	N	Increased Stigma	Decreased Stigma	Change In Nature
						Percent		
School Type								
Control	18	11.1	2	0.0	0	–	–	–
Treatment	36	8.3	3	33.3	1	0.0	100.0	0.0
Classroom	15	0.0	0	–	0	–	–	–
Non-classroom	21	14.3	3	33.3	1	0.0	100.0	0.0
District								
A	9	11.1	1	0.0	0	–	–	–
B	9	0.0	0	–	0	–	–	–
C	9	11.1	1	100.0	1	0.0	100.0	0.0
D	9	11.1	1	0.0	0	–	–	–
E	9	11.1	1	0.0	0	–	–	–
F	9	11.1	1	0.0	0	–	–	–
All schools	54	9.3	5	20.0	1	0.0	100.0	0.0

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-71

Teacher Awareness of Changes in Overall Student Attitude or Behavior During SY 2000/01, by School Type and District, SY 2000/01

		Overall Change In Attitude Or Behavior					
School Type/District	N	Greatly Improved	Slightly Improved	No Change	Slightly Declined	Greatly Declined	Don't Know
				Percent			
School Type							
Control	18	5.6	5.6	72.2	11.1	5.6	0.0
Treatment	36	2.8	41.7	38.9*	5.6	2.8	8.3
Classroom	15	6.7	40.0	40.0	6.7	0.0	6.7
Non-classroom	21	0.0	42.9	38.1	4.8	4.8	9.5
District							
A	9	11.1	44.4	11.1	22.2	11.1	0.0
B	9	0.0	0.0	77.7	0.0	0.0	22.2
C	9	0.0	44.4	55.6	0.0	0.0	0.0
D	9	0.0	44.4	44.4	11.1	0.0	0.0
E	9	11.1	33.3	55.6	0.0	0.0	0.0
F	9	0.0	11.1	55.6	11.1	11.1	11.1
All schools	54	3.7	29.6	50.0	7.4	3.7	5.6

Note: Row percentages sum to 100.0%.

* Difference in proportions is statistically significant at the .05 level. Comparison is between control and treatment schools.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-72

Teacher Awareness of Changes in Rate of Tardiness and Attendance During SY 2000/01, by School Type and District, SY 2000/01

		Rate of Tardiness						Rate of Attendance					
School Type/District	N	Greatly Improved	Slightly Improved	No Change	Slightly Increased	Greatly Increased	Don't Know	Greatly Improved	Slightly Improved	No Change	Slightly Declined	Greatly Declined	Don't Know
		Percent						Percent					
School Type													
Control	17	0.0	5.9	64.7	23.5	5.9	0.0	0.0	0.0	70.6	23.5	5.9	0.0
Treatment	36	8.3	22.2	52.8	11.1	0.0	5.6	2.8	30.6	58.3	0.0	0.0	8.3
Classroom	15	6.7	40.0	46.7	6.7	0.0	0.0	0.0	40.0	53.3	0.0	0.0	6.7
Non-classroom	21	9.5	9.5	57.1	14.3	0.0	9.5	4.8	23.8	61.9	0.0	0.0	9.5
District													
A	9	0.0	0.0	44.4	55.6	0.0	0.0	0.0	22.2	44.4	33.3	0.0	0.0
B	8	0.0	25.0	50.0	0.0	0.0	25.0	0.0	12.5	62.5	0.0	0.0	25.0
C	9	0.0	0.0	77.8	22.2	0.0	0.0	0.0	22.2	77.8	0.0	0.0	0.0
D	9	22.2	11.1	55.6	11.1	0.0	0.0	11.1	22.2	55.6	11.1	0.0	0.0
E	9	11.1	33.3	55.6	0.0	0.0	0.0	0.0	33.3	66.7	0.0	0.0	0.0
F	9	0.0	33.3	55.6	0.0	11.1	0.0	0.0	11.1	66.7	0.0	11.1	11.1
All schools	53	5.7	17.0	56.6	15.1	1.9	3.8	1.9	20.8	62.3	7.5	1.9	5.7

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-73

Teacher Awareness of Changes in Incidence of Disciplinary Problems or Visits to School Nurse During SY 2000/01, by School Type and District, SY 2000/01

		Incidence of Disciplinary Problems						Visits to School Nurse					
School Type/District	**N**	**Greatly Increased**	**Slightly Increased**	**Not Changed**	**Slightly Decreased**	**Greatly Decreased**	**Don't Know**	**Greatly Increased**	**Slightly Increased**	**Not Changed**	**Slightly Decreased**	**Greatly Decreased**	**Don't Know**
		Percent						Percent					
School Type													
Control	17	0.0	23.5	58.8	0.0	17.6	0.0	0.0	11.8	82.4	0.0	0.0	5.9
Treatment	35	2.9	2.9	62.9	5.7	14.3	11.4	0.0	5.6	58.3	22.2	0.0	13.9
Classroom	14	0.0	7.1	64.3	0.0	14.3	14.3	0.0	13.3	46.7	26.7	0.0	13.3
Non-classroom	21	4.8	0.0	61.9	9.5	14.3	9.5	0.0	0.0	66.7	19.0	0.0	14.3
District													
A	8	0.0	25.0	25.0	12.5	37.5	0.0	0.0	11.1	66.7	22.2	0.0	0.0
B	8	0.0	0.0	75.0	0.0	0.0	25.0	0.0	0.0	62.5	12.5	0.0	25.0
C	9	0.0	0.0	77.8	11.1	11.1	0.0	0.0	0.0	100.0	0.0	0.0	0.0
D	9	11.1	11.1	55.6	0.0	22.2	0.0	0.0	0.0	66.7	22.2	0.0	11.1
E	9	0.0	0.0	88.9	0.0	11.1	0.0	0.0	11.1	66.7	22.2	0.0	0.0
F	9	0.0	22.2	44.4	0.0	11.1	22.2	0.0	22.2	33.3	11.1	0.0	33.3
All schools	52	1.9	9.6	61.5	3.8	15.4	7.7	0.0	7.5	66.0	15.1	0.0	11.3

Note: Row percentages sum to 100.0%.

Source: Implementation Study - Teacher Interview, Spring 2001

Exhibit A-74

Teacher Climate Survey: School Atmosphere[1]

	Unadjusted Means				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
A	34	3.58	26	3.62	-0.04	-0.12
B	67	3.09	59	3.19	-0.04	-0.08
C	24	3.21	22	3.23	-0.03	-0.06
D	99	3.32	98	3.41	-0.11	-0.22
E	158	3.37	151	3.31	0.05	0.09
F	29	3.21	24	3.18	0.07	0.14
All schools	411	3.31	380	3.33	-0.02	-0.04

[1] Items scored on a 4-point scale ranging from least positive (1) to most positive (4).

Source: Implementation Study – Teacher Climate Survey, School Atmosphere sub-scale, Spring 2001

Exhibit A-75

Teacher Climate Survey: Student Behavior[1]

	Unadjusted Means				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
A	34	3.06	26	3.16	-0.13	-0.27
B	67	2.62	59	2.75	-0.12	-0.26
C	24	2.48	22	2.62	-0.15	-0.26
D	99	2.80	97	2.85	-0.06	-0.11
E	157	2.79	149	2.75	0.02	0.03
F	29	2.67	24	2.55	0.17	0.38
All schools	410	2.76	377	2.78	-0.03	-0.06

[1] Items scored on a 4-point scale ranging from least positive (1) to most positive (4).

Source: Implementation Study – Teacher Climate Survey, Student Behavior sub-scale, Spring 2001

Custodian

Exhibit A-76

Role of Custodians in School Breakfast Service, SY 2000/01

School Type/District	N	Nature of Custodial Involvement					
		Setting-Up	Trash Removal	Supervision of Students	Cleaning Floors	Others	No Role
		Percent					
School Type							
Control	5	80.0	80.0	20.0	60.0	0.0	20.0
Treatment	10	70.0	90.0	10.0	80.0	10.0	0.0
Classroom	4	25.0	75.0	0.0	50.0	0.0	0.0
Non-classroom	6	100.0	100.0	16.7	100.0	16.7	0.0
District							
A	2	0.0	0.0	0.0	50.0	0.0	50.0
B	3	66.7	100.0	0.0	100.0	0.0	0.0
C	3	100.0	100.0	0.0	66.7	33.3	0.0
D	3	100.0	100.0	0.0	100.0	0.0	0.0
E	3	100.0	100.0	66.7	66.7	0.0	0.0
F	1	100.0	100.0	0.0	0.0	0.0	0.0
All schools	15	73.3	86.7	13.3	73.3	6.7	6.7

Note: Row percentages may sum to more than 100.0% because of multiple responses.

Source: Implementation Study – School Custodian Interview, Spring 2001

Exhibit A-77

Changes in Nature or Level of Custodial Involvement in Breakfast Service in SY 2000/01

School Type/District	Share Reporting Change		Nature of Change						Effect On Workload		
	N	Percent	N	Reduced Use of Cafeteria	Increased Use of Cafeteria	Increased Volume of Trash	Trash From More Locations	Other	Increase	Decrease	No Effect
				Percent of Those Reporting Change							
School Type											
Control	5	20.0	1	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0
Treatment	10	60.0	6	33.3	33.3	33.3	50.0	33.3	50.0	33.3	16.7
Classroom	4	75.0	3	66.7	0.0	33.3	66.7	33.3	66.7	33.3	0.0
Non-classroom	6	50.0	3	0.0	66.7	33.3	33.3	33.3	33.3	33.3	33.3
District											
A	2	50.0	1	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0
B	3	33.3	1	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
C	3	33.3	1	0.0	100.0	100.0	100.0	0.0	100.0	0.0	0.0
D	3	33.3	1	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0
E	3	100.0	3	33.3	66.7	66.7	33.3	0.0	33.3	0.0	66.7
F	1	0.0	0	–	–	–	–	–	–	–	–
All schools	15	46.7	7	28.6	42.9	42.9	42.9	28.6	42.9	28.6	28.6

Note: Row percentages sum to 100.0% .

Source: *Implementation Study – School Custodian Interview, Spring 2001*

Exhibit A-78

Approximate Time Spent by Custodial Staff on Breakfast-Related Tasks on a Typical Day in SY 2000/01

School Type/District	N	Time on Breakfast-Related Tasks (Hours): 0	0-.25	.25-.50	.50-.74	1.00-1.99	2.00 or More	Change from 1999/00: N	Share of Respondents	Average Percent Change
		Percent[1]							Percent[2]	
School Type										
Control	5	20.0	0.0	40.0	0.0	40.0	0.0	5	0.0	--
Treatment	10	0.0	30.0	10.0	10.0	10.0	40.0	10	30.0	101.1
Classroom	4	0.0	50.0	25.0	0.0	0.0	25.0	4	50.0	126.7
Non-classroom	6	0.0	16.7	0.0	16.7	16.7	50.0	6	16.7	50.0
District										
A	2	50.0	50.0	0.0	0.0	0.0	0.0	2	0.0	--
B	3	0.0	0.0	33.3	0.0	33.3	33.3	3	33.3	-46.7
C	3	0.0	0.0	33.3	0.0	33.3	33.3	3	33.3	50.0
D	3	0.0	33.3	33.3	33.3	0.0	0.0	3	0.0	--
E	3	0.0	0.0	0.0	0.0	33.3	66.7	3	33.3	300.0
F	1	100.0	0.0	0.0	0.0	0.0	0.0	1	0.0	--
All schools	15	6.7	20.0	20.0	6.7	20.0	26.7	15	20.0	101.1

Note: Row percentages (1) sum to 100.0%. Row percentages (2) are independent.

Source: Implementation Study - School Custodian Interview, Spring 2001

Exhibit A-79

Treatment School Custodians' Assessment of the Impact of the SBPP on the School and its Students, SY 2000/01

Serving Location/District	N	Impact on School and Students			
		Positive	Negative	Neutral	Don't Know
		Percent			
Serving Location					
Classroom	4	75.0	0.0	0.0	25.0
Non-classroom	6	66.7	0.0	33.3	0.0
District					
A	1	100.0	0.0	0.0	0.0
B	2	50.0	0.0	50.0	0.0
C	2	100.0	0.0	0.0	0.0
D	2	50.0	0.0	50.0	0.0
E	2	100.0	0.0	0.0	0.0
F	1	0.0	0.0	0.0	100.0
All schools	10	70.0	0.0	20.0	10.0

Note: Row percentages sum to 100.0%.

Source: Implementation Study - School Custodian Interview, Spring 2001

Students and Parents

Exhibit A-80

Student Responses to Questions about Their Breakfast Eating Habits[1]

	Treatment Schools		Control Schools	
Response	N	Percent	N	Percent
Usually eats breakfast at home	2208	72.60**	2066	81.80
Ever eat breakfast at school	2210	82.31**++	2066	63.55
Eats breakfast more at school this year than last year	2183	50.11**	2022	25.62
Likes School Breakfast Program	2106	52.94**	1868	43.20

[1] Percentage of students that gave response.

**Difference between treatment and control schools is statistically significant at the .01 level.
++The interaction between treatment and district is significant at the .01 level.

Source: Implementation Study - Student Survey, Spring 2001

Exhibit A-81

Reasons Students Give for Eating School Breakfast More This Year than Last Year

School Type/District	N	Food Better	Costs Less	Parents' Preference
			Percent	
School Type[1]				
Control	518	21.24	4.8	15.8
Treatment	1112	19.33	24.7	13.6
District[2]				
A	154	17.5	15.6	15.6
B	306	19.3	18.6	11.1
C	116	21.6	11.2	2.6
D	325	12.0	15.1	7.4
E	606	24.3	20.1	22.9
F	123	22.8	28.5	7.3
All schools	1630	19.9	18.4	14.3

[1] Percent-by-treatment represents the number of students that stated that reason in treatment and control schools out of the total number students that stated that they ate breakfast more this year.

[2] Percent-by-district represents the number of students in a district stating that reason out of the total number of students in that district that stated that they ate breakfast more this year.

Source: Implementation Study - Student Survey, Spring 2001

Exhibit A-82

Reasons Students Give for Not Eating Breakfast at School the Previous Week

School Type/District	N	Ate Breakfast at Home	Too Little Time for Eating Breakfast	Don't Like the Food
			Percent	
School Type[1]				
Control	781	65.7	18.9	7.0
Treatment	398	62.8	19.6	14.1
District [2]				
A	73	67.1	23.3	8.2
B	150	56.7	25.3	14.7
C	82	35.4	19.5	6.1
D	443	70.0	18.5	11.3
E	392	67.6	16.8	6.1
F	39	64.1	17.9	10.3
All schools	1179	64.7	19.2	9.4

[1] Percent-by-treatment represents the number of students that stated that reason in treatment and control schools out of the total number students that stated that they had not eaten breakfast at school.

[2] Percent-by-district represents the number of students in a district stating that reason out of the total number of students in that district that stated that they had not eaten breakfast at school.

Source: Implementation Study - Student Survey, Spring 2001

Exhibit A-83

Parents' Attitude Toward Their Childs' School Breakfast Program[1]

Response	Treatment Schools		Control Schools	
	N	Percent	N	Percent
School breakfast is a well-balanced meal.	1714	42.77**++	1661	37.27
School breakfasts should only be available for low-income families.	1689	4.91	1638	4.27
Children like the school breakfasts.	1714	41.48**+	1661	30.28
School breakfasts are served at a convenient time and place.	1714	69.78**	1661	56.47
It is easy to participate in the SBP.	1714	76.02**++	1661	58.04
Received enough information about SBP.	1714	49.36**+	1661	40.10
SBP gives all children opportunity to eat.	1714	82.44**++	1661	67.97

[1] Percentage of parents answering "strongly agree."

**Difference between treatment and control schools is statistically significant at the .01 level.

+ The interaction between treatment and district is significant at the .05 level.

++The interaction between treatment and district is significant at the .01 level.

Source: Implementation Study - Student Survey, Spring 2001.

Breakfast Menu Survey

Exhibit A-84

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, All Districts

		Treatment Schools		
	Control Schools	All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	34	44	51	41
2	36	31	31	31
3	14	6	13	4
4 or 5	16	19	6	23
Mean items per day	*2.1*	*2.0*	*1.7*	*2.1*
Mean number of different items per week	*2.2*	*2.1*	*1.9*	*2.2*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0	1	0	1
1	67	67	75	64
2	25	23	25	22
3	7	8	0	11
4 or 5	1	2	0	2
Mean items per day	*1.4*	*1.4*	*1.3*	*1.5*
Mean number of different items per week	*2.7*	*2.6*	*2.0*	*2.8*
Number of Separate Meats/Meat Alternates Offered per Day[1]				
None	70	71	76	70
1	26	27	23	28
2	4	2	1	2
Mean items per day	*0.3*	*0.3*	*0.3*	*0.3*
Mean number of different items per week	*1.2*	*1.1*	*1.0*	*1.1*
Number of Separate Grains/Breads Offered per Day[1,2]				
None	0	3	11	0
1	15	20	26	19
2	62	60	46	65
3	18	13	16	12
4	5	4	0	5
Mean items per day	*2.1*	*1.9*	*1.7*	*2.0***
Mean number of different items per week	*4.4*	*4.3*	*4.2*	*4.3*
Number of Combination Entrees Offered per Day				
None	85	85	78	87
1	14	15	22	13
2	1	0	0	0
Mean items per day	*0.2*	*0.2*	*0.2*	*0.1*
Mean number of different items per week	*0.5*	*0.6*	*1.0*	*0.5*
Number of Daily Menus[3]	358	377	87	290

[1] Not included in combination entrees.

[2] All varieties of cold cereals counted as one item.

[3] Includes breakfast menus collected during respective target weeks from 73 control schools and 78 treatment schools (18 classroom and 60 non-classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools due to rounding.

**Difference is statistically significant at the .01 level. Comparisons are between control and treatment schools and between classroom and non-classroom treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-85

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, District A

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	0	37	36	38
2	37	61	64	58
3	50	3	0	4
4 or 5	13	0	0	0
Mean items per day	*2.8*	*1.7*	*1.6*	*1.7*
Mean number of different items per week	*2.8*	*1.9*	*2.0*	*1.8*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0	5	0	8
1	34	32	71	8
2	66	63	29	83
3	0	0	0	0
4 or 5	0	0	0	0
Mean items per day	*1.7*	*1.6*	*1.3*	*1.8*
Mean number of different items per week	*1.9*	*2.1*	*1.3*	*2.6*
Number of Separate Meats/Meat Alternates Offered per Day[1]				
None	24	39	86	13
1	42	47	14	67
2	34	13	0	21
Mean items per day	*1.1*	*0.7*	*0.1*	*1.1*
Mean number of different items per week	*3.0*	*2.1*	*0.7*	*3.0*
Number of Separate Grains/Breads Offered per Day[1,2]				
None	0	0	0	0
1	16	26	29	25
2	42	53	64	46
3	42	21	7	29
4	0	0	0	0
Mean items per day	*2.3*	*1.9*	*1.8*	*2.0*
Mean number of different items per week	*5.0*	*5.1*	*5.0*	*5.2*
Number of Combination Entrees Offered per Day				
None	87	87	93	83
1	13	13	7	17
2	0	0	0	0
Mean items per day	*0.1*	*0.1*	*0.1*	*0.2*
Mean number of different items per week	*0.6*	*0.6*	*0.3*	*0.8*
Number of Daily Menus[3]	38	38	14	24

[1] Not included in combination entrees.

[2] All varieties of cold cereals counted as one item.

[3] Includes breakfast menus collected during respective target weeks from 8 control schools and 8 treatment schools (3 classroom and 5 non-classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools because of rounding.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-86

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, District B

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	30	48	93	33
2	70	52	7	67
3	0	0	0	0
4 or 5	0	0	0	0
Mean items per day	*1.7*	*1.5*	*1.1*	*1.7*
Mean number of different items per week	*1.8*	*1.6*	*1.3*	*1.7*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0	0	0	0
1	2	18	67	2
2	55	37	33	38
3	38	40	0	53
4 or 5	5	5	0	7
Mean items per day	*2.5*	*2.3*	*1.3*	*2.7*
Mean number of different items per week	*5.8*	*4.8*	*1.3*	*5.9*
Number of Separate Meats/Meat Alternates Offered per Day[1]				
None	43	52	80	42
1	53	47	20	56
2	3	2	0	2
Mean items per day	*0.6*	*0.5*	*0.2*	*0.6*
Mean number of different items per week	*2.2*	*1.9*	*1.0*	*2.2*
Number of Separate Grains/Breads Offered per Day[1,2]				
None	0	0	0	0
1	13	15	0	20
2	45	53	47	56
3	32	32	53	24
4	10	0	0	0
Mean items per day	*2.4*	*2.2*	*2.5*	*2.0*
Mean number of different items per week	*6.0*	*5.3*	*5.0*	*5.3*
Number of Combination Entrees Offered per Day				
None	68	62	60	62
1	32	38	40	38
2	0	0	0	0
Mean items per day	*0.3*	*0.4*	*0.4*	*0.4*
Mean number of different items per week	*1.6*	*1.9*	*2.0*	*1.9*
Number of Daily Menus[3]	60	60	15	45

[1] Not included in combination entrees.

[2] All varieties of cold cereals counted as one item.

[3] Includes breakfast menus collected during respective target weeks from 12 control schools and 12 treatment schools (3 classroom and 9 non-classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools because of rounding.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-87

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, District C

	Control Schools	Treatment Schools All	Treatment Schools Classroom	Treatment Schools Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	60	50	na[1]	50
2	40	50	na	50
3	0	0	na	0
4 or 5	0	0	na	0
Mean items per day	*1.4*	*1.5*	*na*	*1.5*
Mean number of different items per week	*1.5*	*1.5*	*na*	*1.5*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0	0	na	0
1	30	25	na	25
2	60	35	na	35
3	10	25	na	25
4 or 5	0	15	na	15
Mean items per day	*1.8*	*2.3*	*na*	*2.3*
Mean number of different items per week	*3.5*	*3.5*	*na*	*3.5*
Number of Separate Meats/Meat Alternates Offered per Day[2]				
None	60	85	na	85
1	40	15	na	15
2	0	0	na	0
Mean items per day	*0.4*	*0.2*	*na*	*0.2*
Mean number of different items per week	*0.8*	*0.3*	*na*	*0.3*
Number of Separate Grains/Breads Offered per Day[2,3]				
None	0	0	na	0
1	0	0	na	0
2	5	5	na	5
3	35	30	na	30
4	60	65	na	65
Mean items per day	*3.6*	*3.6*	*na*	*3.6*
Mean number of different items per week	*4.0*	*4.3*	*na*	*4.3*
Number of Combination Entrees Offered per Day				
None		40	na	40
1	85	60	na	60
2	15	0	na	0
Mean items per day	*1.2*	*0.6*	*na*	*0.6*
Mean number of different items per week	*1.3*	*0.8*	*na*	*0.8*
Number of Daily Menus[4]	20	20	0	20

na = not applicable

[1] Schools in District C did not serve breakfast in the classroom.

[2] Not included in combination entrees.

[3] All varieties of cold cereals counted as one item.

[4] Includes breakfast menus collected during respective target weeks from 4 control schools and 4 treatment schools (all non-classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools because of rounding.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-88

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, District D

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	0	0	0	0
2	6	0	0	0
3	31	14	0	15
4 or 5	63	86	100	85
Mean items per day	*3.6*	*3.9*	*4.0*	*3.9*
Mean number of different items per week	*3.6*	*3.9*	*4.0*	*3.9*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0	0	0	0
1	100	100	100	100
2	0	0	0	0
3	0	0	0	0
4 or 5	0	0	0	0
Mean items per day	*1.0*	*1.0*	*1.0*	*1.0*
Mean number of different items per week	*1.0*	*1.2*	*1.0*	*1.3*
Number of Separate Meats/Meat Alternates Offered per Day[1]				
None	100	70	0	75
1	0	30	100	25
2	0	0	0	0
Mean items per day	*0.0*	*0.3*	*1.0*	*0.3*
Mean number of different items per week	*0.0*	*0.9*	*3.0*	*0.8*
Number of Separate Grains/Breads Offered per Day[1,2]				
None	0	0	0	0
1	0	24	0	25
2	82	68	0	72
3	18	8	100	3
4	0	0	0	0
Mean items per day	*2.2*	*1.8*	*3.0*	*1.8*
Mean number of different items per week	*2.2*	*2.5*	*5.0*	*2.4*
Number of Combination Entrees Offered per Day				
None	100	100	100	100
1	0	0	0	0
2	0	0	0	0
Mean items per day	*0.0*	*0.0*	*0.0*	*0.0*
Mean number of different items per week	*0.0*	*0.0*	*0.0*	*0.0*
Number of Daily Menus[3]	84	84	5	79

[1] Not included in combination entrees.

[2] All varieties of cold cereals counted as one item.

[3] Includes breakfast menus collected during respective target weeks from 17 control schools and 17 treatment schools (1 classroom and 16 non-classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools because of rounding.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-89

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, District E

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	64	73	83	70
2	34	27	17	30
3	2	0	0	0
4 or 5	0	0	0	0
Mean items per day	*1.4*	*1.3*	*1.2*	*1.3*
Mean number of different items per week	*1.4*	*1.4*	*1.3*	*1.4*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0	0	0	0
1	87	85	97	82
2	12	13	3	16
3	1	2	0	2
4 or 5	0	0	0	0
Mean items per day	*1.1*	*1.2*	*1.0*	*1.2*
Mean number of different items per week	*2.5*	*2.7*	*2.8*	*2.7*
Number of Separate Meats/Meat Alternates Offered per Day[1]				
None	82	84	80	85
1	18	16	20	15
2	0	0	0	0
Mean items per day	*0.2*	*0.2*	*0.2*	*0.1*
Mean number of different items per week	*0.8*	*0.8*	*1.0*	*0.7*
Number of Separate Grains/Breads Offered per Day[1,2]				
None	0	0	0	0
1	27	18	27	16
2	73	76	73	77
3	0	5	0	7
4	0	1	0	1
Mean items per day	*1.7*	*1.9*	*1.7*	*1.9*
Mean number of different items per week	*4.3*	*4.8*	*4.3*	*4.9*
Number of Combination Entrees Offered per Day				
None	95	95	97	95
1	5	5	3	5
2	0	0	0	0
Mean items per day	*0.1*	*0.0*	*0.0*	*0.0*
Mean number of different items per week	*0.3*	*0.2*	*0.2*	*0.2*
Number of Daily Menus[3]	133	152	30	122

[1] Not included in combination entrees.

[2] All varieties of cold cereals counted as one item.

[3] Includes breakfast menus collected during respective target weeks from 27 control schools and 32 treatment schools (6 classroom and 26 non-classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools because of rounding.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-90

Frequency with Which Major Food Groups Are Offered and Variety Within Food Groups, District F

	Control Schools	Treatment Schools: All	Treatment Schools: Classroom	Treatment Schools: Non-classroom
	Percent of Daily Breakfast Menus			
Number of Types of Milk Offered per Day				
1	30	0	0	na[1]
2	65	52	52	na
3	4	48	48	na
4 or 5	0	0	0	na
Mean items per day	*1.7*	*2.5*	*2.5*	*na*
Mean number of different items per week	*2.0*	*2.6*	*2.6*	*na*
Number of Fruits/Juices/Vegetables Offered per Day				
None	0		0	na
1	83	0	48	na
2	17	48	52	na
3	0	52	0	na
4 or 5	0	0	0	na
Mean items per day	*1.2*	*0*	*1.5*	*na*
Mean number of different items per week	*2.6*	*1.5*	*2.0*	*na*
Number of Separate Meats/Meat Alternates Offered per Day[2]				
None	43	78	78	na
1	57	17	17	na
2	0	4	4	na
Mean items per day	*0.3*	*0.3*	*0.3*	*na*
Mean number of different items per week	*1.8*	*0.8*	*0.8*	*na*
Number of Separate Grains/Breads Offered per Day[2,3]				
None	0	43	43	na
1	57	48	48	na
2	39	9	9	na
3	4	0	0	na
4	0	0	0	na
Mean items per day	*1.5*	*0.7*	*0.7*	*na*
Mean number of different items per week	*5.2*	*3.0*	*3.0*	*na*
Number of Combination Entrees Offered per Day				
None	87	52	52	na
1	9	48	48	na
2	4	0	0	na
Mean items per day	*0.6*	*0.3*	*0.3*	*na*
Mean number of different items per week	*1.8*	*0.8*	*0.8*	*na*
Number of Daily Menus[4]	23	23	23	0

na = not applicable

[1] Schools in District F did not serve breakfast in locations other than the classroom.

[2] Not included in combination entrees.

[3] All varieties of cold cereals counted as one item.

[4] Includes breakfast menus collected during respective target weeks from 5 control schools and 5 treatment schools (all classroom).

Note: Percents for control and treatment schools may not sum to percents for all schools because of rounding.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-91

Share of Breakfast Menus Containing Foods Commonly Offered, All Districts

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Milk	100.0	100.0	100.0	100.0
Milk, 1%	83.8	82.8	56.3	90.7**
Milk, flavored, 1%	39.4	37.7	25.3	41.4
Milk, 2%	39.7	34.0	44.8	30.7
Milk, skim	31.0	34.2	40.2	32.4
Milk, flavored, skim	13.4	8.8	1.1	11.0
Milk, whole	3.1	1.3	0.0	1.7
Milk, flavored, 2%	1.7	2.7	5.7	1.7
Fruits, Juices and Vegetables	100.0	99.5	100.0	99.3
Citrus juice	63.1	66.0	59.8	67.9
Non-citrus juice	50.6	51.5	59.8	49.0
Fresh fruit	11.2	11.4	3.4	13.8
Canned fruit	13.4	8.8	0.0	11.4
Meat/Meat Alternates[1]	30.2	28.9	24.1	30.3
Sausage	10.9	6.6	6.9	6.6
Yogurt	8.9	8.2	4.6	9.3
Eggs	8.9	5.3	0.0	6.9*
Cheese	3.1	8.0*	10.3	7.2
Grains/Breads[1]	100.0	97.3*	88.5	100.0**
Cold cereal	94.7	86.7	71.3	91.4**
Bread, bagels and English muffins	40.8	32.1	18.4	36.2*
Muffins and quick bread	17.0	18.3	11.5	20.3
Sweet rolls and Danish	9.8	10.1	11.5	9.7
Doughnuts	8.1	9.3	4.6	10.7
Pancakes and waffles	9.5	7.2	4.6	7.9
Crackers[2]	3.6	11.4*	19.5	9.0
Hot cereal and grits	12.3	1.6**	0.0	2.1
Toaster pastry	5.9	6.1	9.2	5.2
Granola/cereal/energy bars	5.0	6.4	8.0	5.9
Biscuits	5.9	5.3	8.0	4.5
Combination Entrees	15.1	15.4	21.8	13.4
French toast	6.1	6.1	8.0	5.5
Breakfast burrito	5.6	3.4	0.0	4.5
Breakfast sandwich	2.8	3.4	11.5	1.0**
Breakfast pizza	1.7	2.4	2.3	2.4
Other Menu Items[3]	4.2	1.6	0.0	2.1
Bacon	3.4	0.5*	0.0	0.7
Number of Daily Menus[4]	358	377	87	290

[1] Not part of a combination entrée.

[2] Includes sandwich-type crackers with cheese or peanut butter and graham crackers.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 73 control schools and 78 treatment schools (18 classroom and 60 non-classroom).

Notes: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools. Comparisons are between control and treatments schools and between classroom and non-classroom treatment schools.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-92

Share of Breakfast Menus Containing Foods Commonly Offered, District A

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Milk	100.0	100.0	100.0	100.0
Milk, skim	100.0	86.8	92.9	83.3
Milk, 2%	50.0	28.9	42.9	20.8
Milk, flavored, 1%	50.0	26.3	0.0	41.7
Milk, 1%	63.2	10.5	28.6	0.0
Milk, whole	13.2	13.2	0.0	20.8
Fruits, Juices and Vegetables	100.0	94.7	100.0	91.7
Citrus juice	97.4	86.8	100.0	79.2
Non-citrus juice	68.4	60.5	28.6	79.2
Canned fruit	0.0	7.9	0.0	12.5
Frozen fruit	0.0	2.6	0.0	4.2
Meat/Meat Alternates[1]	76.3	60.5	14.3	87.5
Sausage	68.4	44.7	7.1	66.7
Eggs	21.1	10.5	0.0	16.7
Chicken patty	15.8	7.9	7.1	8.3
Cheese	2.6	5.3	0.0	8.3
Ham	2.6	2.6	0.0	4.2
Yogurt	0.0	2.6	0.0	4.2
Grains/Breads[1]	100.0	100.0	100.0	100.0
Cold cereal	97.4	81.6	78.6	83.3
Biscuits	42.1	39.5	35.7	41.7
Bread, bagels and English muffins	36.8	18.4	7.1	25.0
Hot cereal and grits	26.3	10.5	0.0	16.7
Pancakes and waffles	18.4	10.5	0.0	16.7
Sweet rolls and Danish	2.6	7.9	7.1	8.3
Muffins and quick bread	0.0	7.9	14.3	4.2
Granola/cereal/energy bars	0.0	7.9	14.3	4.2
Toaster pastry	0.0	5.3	14.3	0.0
Doughnuts	2.6	2.6	7.1	0.0
Crackers[2]	0.0	2.6	0.0	4.2
Combination Entrees	13.2	13.2	7.1	16.7
French toast	10.5	7.9	7.1	8.3
Breakfast pizza	2.6	2.6	0.0	4.2
Breakfast burrito	0.0	2.6	0.0	4.2
Other Menu Items[3]	36.8	15.8	0.0	25.0
Bacon	28.9	5.3	0.0	8.3
Fruit drink/punch	13.2	10.5	0.0	16.7
Number of Daily Menus[4]	38	38	14	24

[1] Not part of a combination entrée.

[2] Includes sandwich-type crackers with cheese or peanut butter and graham crackers.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 8 control schools and 8 treatment schools (3 classroom and 5 non-classroom).

Note: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-93

Share of Breakfast Menus Containing Foods Commonly Offered, District B

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
Milk	100.0	100.0	100.0	100.0
Milk, 1%	100.0	100.0	100.0	100.0
Milk, flavored, 1%	68.3	51.7	6.7	66.7
Fruits, Juices and Vegetables	100.0	100.0	100.0	100.0
Non-citrus juice	73.3	86.7	100.0	82.2
Citrus juice	63.3	68.3	33.3	80.0
Canned fruit	80.0	50.0	0.0	66.7
Fresh fruit	16.7	16.7	0.0	22.2
Frozen fruit	3.3	5.0	0.0	6.7
Meat/Meat Alternates[1]	56.7	48.3	20.0	57.8
Eggs	36.7	26.7	0.0	35.6
Yogurt	16.7	13.3	0.0	17.8
Sausage	6.7	5.0	0.0	6.7
Cheese	0.0	5.0	20.0	0.0
Grains/Breads[1]	100.0	100.0	100.0	100.0
Cold cereal	100.0	98.3	100.0	97.8
Muffins and quick bread	40.0	30.0	0.0	40.0
Sweet rolls and Danish	21.7	20.0	20.0	20.0
Pancakes and waffles	16.7	11.7	0.0	15.6
Hot cereal and grits	25.0	0.0	0.0	0.0
Crackers[2]	0.0	23.3	93.3	0.0
Doughnuts	8.3	11.7	6.7	13.3
Granola/cereal/energy bars	8.3	6.7	13.3	4.4
Biscuits	6.7	5.0	0.0	6.7
Toaster pastry	8.3	3.3	0.0	4.4
Bread, bagels and English muffins	3.3	6.7	20.0	2.2
Combination Entrees	31.7	38.3	40.0	37.8
French toast	16.7	18.3	20.0	17.8
Breakfast pizza	8.3	10.0	0.0	13.3
Breakfast sandwich	6.7	10.0	20.0	6.7
Other Menu Items[3]	0.0	0.0	0.0	0.0
Number of Daily Menus[4]	60	60	15	45

[1] Not part of a combination entrée.

[2] Includes sandwich-type crackers with cheese or peanut butter and graham crackers.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 12 control schools and 12 treatment schools (3 classroom and 9 non-classroom).

Note: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-94

Share of Breakfast Menus Containing Foods Commonly Offered, District C

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Milk	100.0	100.0	na[1]	100.0
Milk, 1%	100.0	100.0	na	100.0
Milk, flavored, 1%	25.0	50.0	na	50.0
Milk, whole	15.0	0.0	na	0.0
Fruits, Juices and Vegetables	100.0	100.0	na	100.0
Citrus juice	55.0	80.0	na	80.0
Fresh fruit	70.0	60.0	na	60.0
Non-citrus juice	50.0	50.0	na	50.0
Meat/Meat Alternates[2]	40.0	15.0	na	15.0
Yogurt	40.0	15.0	na	15.0
Grains/Breads[2]	100.0	100.0	na	100.0
Cold cereal	100.0	100.0	na	100.0
Bread, bagels and English muffins	95.0	90.0	na	90.0
Doughnuts	80.0	95.0	na	95.0
Muffins and quick bread	65.0	70.0	na	70.0
Sweet rolls and danish	15.0	5.0	na	5.0
Combination Entrees	100.0	60.0	na	60.0
Breakfast burrito	100.0	60.0	na	60.0
Breakfast sandwich	15.0	0.0	na	0.0
Other Menu Items[3]	0.0	0.0	na	0.0
Number of Daily Menus[4]	20	20	0	20

na = not applicable

[1] Schools in District C did not serve breakfast in the classroom

[2] Not part of a combination entrée.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 4 control schools and 4 treatment schools (all non-classroom).

Note: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-95

Share of Breakfast Menus Containing Foods Commonly Offered, District D

	Control Schools	Treatment Schools All	Treatment Schools Classroom	Treatment Schools Non-classroom
	Percent of Daily Breakfast Menus			
Milk	100.0	100.0	100.0	100.0
Milk, 2%	100.0	100.0	100.0	100.0
Milk, 1%	94.0	97.6	100.0	97.6
Milk, skim	79.8	94.0	100.0	94.0
Milk, flavored, 1%	77.4	89.3	100.0	89.3
Milk, flavored, 2%	6.0	6.0	0.0	6.0
Fruits, Juices and Vegetables	100.0	100.0	100.0	100.0
Citrus juice	100.0	95.2	100.0	95.2
Fresh fruit	0.0	4.8	0.0	4.8
Meat/Meat Alternates[1]	0.0	29.8	100.0	29.8
Cheese	0.0	17.9	60.0	17.9
Peanut butter	0.0	6.0	20.0	6.0
Yogurt	0.0	6.0	20.0	6.0
Grains/Breads[1]	100.0	100.0	100.0	100.0
Cold cereal	100.0	76.2	100.0	76.2
Bread, bagels and English muffins	97.6	77.4	100.0	77.4
Hot cereal and grits	17.9	2.4	0.0	2.4
Crackers[2]	0.0	17.9	60.0	17.9
Muffins and quick bread	0.0	6.0	20.0	6.0
Sweet rolls and danish	0.0	4.8	20.0	4.8
Combination Entrees	0.0	0.0	0.0	0.0
Other Menu Items[3]	0.0	0.0	0.0	0.0
Number of Daily Menus[4]	84	84	5	79

[1] Not part of a combination entrée.

[2] Includes sandwich-type crackers with cheese or peanut butter and graham crackers.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 17 control schools and 17 treatment schools (1 classroom and 16 non-classroom).

Note: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-96

Share of Breakfast Menus Containing Foods Commonly Offered, District E

	Control Schools	Treatment Schools All	Treatment Schools Classroom	Treatment Schools Non-classroom
		Percent of Daily Breakfast Menus		
Milk	100.0	100.0	100.0	100.0
Milk, 1%	88.0	96.1	83.3	99.2
Milk, flavored, skim	36.1	21.7	3.3	26.2
Milk, 2%	12.0	6.6	16.7	4.1
Milk, flavored, 1%	0.0	2.6	13.3	0.0
Fruits, Juices and Vegetables	100.0	100.0	100.0	100.0
Non-citrus juice	65.4	59.9	50.0	62.3
Citrus juice	34.6	40.8	36.7	41.8
Fresh fruit	10.5	11.2	10.0	11.5
Raisins	3.0	5.3	6.7	4.9
Meat/Meat Alternates[1]	18.0	15.8	20.0	14.8
Yogurt	10.5	9.2	10.0	9.0
Cheese	7.5	6.6	10.0	5.7
Grains/Breads[1]	100.0	100.0	100.0	100.0
Cold cereal	99.2	100.0	100.0	100.0
Muffins and quick bread	15.0	17.1	13.3	18.0
Bread, bagels and English muffins	13.5	17.1	20.0	16.4
Sweet rolls and danish	12.8	10.5	10.0	10.7
Granola/cereal/energy bars	9.8	11.2	10.0	11.5
Toaster pastry	9.0	10.5	10.0	10.7
Pancakes and waffles	9.0	9.2	6.7	9.8
Crackers[2]	9.8	8.6	0.0	10.7
Doughnuts	5.3	4.6	3.3	4.9
Combination Entrees	5.3	4.6	3.3	4.9
French toast	5.3	4.6	3.3	4.9
Other Menu Items[3]	0.0	0.0	0.0	0.0
Number of Daily Menus[4]	133	152	30	122

[1] Not part of a combination entrée.

[2] Includes sandwich-type crackers with cheese or peanut butter and graham crackers.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 27 control schools and 32 treatment schools (6 classroom and 26 non-classroom).

Note: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-97

Share of Breakfast Menus Containing Foods Commonly Offered, District F

	Control Schools	Treatment Schools		
		All	Classroom	Non-classroom
	Percent of Daily Breakfast Menus			
Milk	100.0	100.0	100.0	na[1]
Milk, 2%	100.0	100.0	100.0	na
Milk, skim	26.1	73.9	73.9	na
Milk, flavored, 1%	47.8	52.2	52.2	na
Milk, flavored, 2%	0.0	21.7	21.7	na
Fruits, Juices and Vegetables	100.0	100.0	100.0	na
Non-citrus juice	60.9	78.3	78.3	na
Citrus juice	43.5	73.9	73.9	na
Fresh fruit	8.7	0.0	0.0	na
Hash browns	4.3	0.0	0.0	na
Meat/Meat Alternates[2]	56.5	21.7	21.7	na
Sausage	39.1	21.7	21.7	na
Ham	8.7	4.3	4.3	na
Eggs	8.7	0.0	0.0	na
Grains/Breads[2]	100.0	56.5	56.5	na
Bread, bagels and English muffins	47.8	4.3	4.3	na
Cold cereal	26.1	4.3	4.3	na
Muffins and quick bread	17.4	13.0	13.0	na
Toaster pastry	17.4	13.0	13.0	na
Pancakes and waffles	13.0	8.7	8.7	na
Hot cereal and grits	17.4	0.0	0.0	na
Sweet rolls and danish	4.3	8.7	8.7	na
Biscuits	4.3	8.7	8.7	na
Doughnuts	0.0	4.3	4.3	na
Combination Entrees	13.0	47.8	47.8	na
Breakfast sandwich	13.0	30.4	30.4	na
French toast	4.3	8.7	8.7	na
Breakfast pizza	0.0	8.7	8.7	na
Other Menu Items[3]	4.3	0.0	0.0	na
Bacon	4.3	0.0	0.0	na
Number of Daily Menus[4]	23	23	23	0

na = not applicable

[1] Schools in District F did not serve breakfast in locations other than the classroom.

[2] Not part of a combination entrée.

[3] Foods that do not contribute to satisfying the USDA meal patterns for food-based menu planning systems.

[4] Includes breakfast menus collected during respective target weeks from 5 control schools and 5 treatment schools (all classroom).

Note: Exhibit is limited to items that appeared in at least three percent of menus for either control or treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-98

Mean Nutrient Profile of Breakfasts Served by School Type, All Districts

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	22.8	21.9	22.4	21.7
Protein	25%	51.7	49.6	48.6	49.9
Vitamin A	25%	53.7	52.8	47.5	54.3
Vitamin C	25%	72.4	71.3	64.1	73.5
Calcium	25%	45.6	44.8	41.8	45.6
Iron	25%	49.7	47.0	41.9	48.5
Percent of Food Energy from:					
Total fat	$\leq 30\%$	24.5	24.3	26.2	23.7*
Saturated fat	< 10%	8.2	8.2	8.9	8.0
Carbohydrate	$> 55\%^1$	64.2	64.3	62.3	64.9
Mean Amount					
Cholesterol (mg)	$\leq 75^1$	33.0	27.2*	24.2	28.1
Sodium (mg)	$\leq 600^1$	583.3	534.9	556.7	528.4
Dietary Fiber (gm)	$–^2$	2.7	2.4	2.0	2.5*
Number of Schools		73	78	18	60

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.

[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

* Difference is statistically significant at the .05 level. Comparisons are between control and treatment schools and classroom and non-classroom treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-99

Mean Nutrient Profile of Breakfasts Served by School Type, District A

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	28.1	25.4	24.5	26.0
Protein	25%	67.3	61.8	54.8	66.0
Vitamin A	25%	50.5	50.6	59.3	45.4
Vitamin C	25%	67.3	75.1	110.0	54.1
Calcium	25%	41.5	43.8	45.4	42.8
Iron	25%	57.4	55.3	56.4	54.7
Percent of Food Energy from:					
Total fat	$\leq 30\%$	30.7	30.1	25.9	32.7
Saturated fat	< 10%	10.1	9.7	7.7	10.9
Carbohydrate	> 55%[1]	56.7	57.4	63.0	54.0
Mean Amount					
Cholesterol (mg)	≤ 75[1]	56.4	44.9	23.3	57.8
Sodium (mg)	≤ 600[1]	976.4	770.0	658.7	836.7
Dietary Fiber (gm)	–[2]	1.9	1.8	2.0	1.7
Number of Schools		8	8	3	5

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.

[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-100

Mean Nutrient Profile of Breakfasts Served by School Type, District B

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	22.6	19.5	16.6	20.4
Protein	25%	48.4	42.7	36.6	44.7
Vitamin A	25%	44.3	37.6	32.2	39.4
Vitamin C	25%	48.4	39.0	24.7	43.7
Calcium	25%	45.0	37.4	30.9	39.6
Iron	25%	40.6	35.9	33.6	36.7
Percent of Food Energy from:					
Total fat	≤ 30%	20.3	22.0	26.1	20.7
Saturated fat	< 10%	7.0	7.9	10.2	7.1
Carbohydrate	> 55%[1]	68.6	66.3	61.5	67.9
Mean Amount					
Cholesterol (mg)	≤ 75[1]	52.9	39.2	16.6	46.7
Sodium (mg)	≤ 600[1]	529.3	461.7	378.5	489.4
Dietary Fiber (gm)	--[2]	2.5	2.0	1.4	2.1
Number of Schools		12	12	3	9

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.

[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-101

Mean Nutrient Profile of Breakfasts Served by School Type, District C

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	18.9	19.8	na[3]	19.8
Protein	25%	42.8	41.7	na	41.7
Vitamin A	25%	29.1	36.2	na	36.2
Vitamin C	25%	41.4	45.0	na	45.0
Calcium	25%	39.4	37.4	na	37.4
Iron	25%	25.7	34.8	na	34.8
Percent of Food Energy from:					
Total fat	≤ 30%	24.8	25.9	na	25.9
Saturated fat	< 10%	10.1	9.8	na	9.8
Carbohydrate	> 55%[1]	62.8	62.4	na	62.4
Mean Amount					
Cholesterol (mg)	≤ 75[1]	33.7	29.1	na	29.1
Sodium (mg)	≤ 600[1]	444.8	477.7	na	477.7
Dietary Fiber (gm)	–[2]	1.9	1.8	na	1.8
				na	
Number of Schools		4	4	0	4

RDA = Recommended Dietary Allowance

na = not applicable

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.

[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

[3] Schools in District C did not serve breakfast in classrooms.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-102

Mean Nutrient Profile of Breakfasts Served by School Type, District D

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	21.1	19.9	17.0	20.1
Protein	25%	48.4	46.6	38.3	47.2
Vitamin A	25%	50.8	44.4	29.2	45.4
Vitamin C	25%	117.7	104.1	84.1	105.3
Calcium	25%	43.1	42.2	34.2	42.7
Iron	25%	59.8	46.1	25.0	47.4
Percent of Food Energy from:					
Total fat	≤ 30%	23.2	24.3	25.5	24.2
Saturated fat	< 10%	8.0	8.9	9.7	8.8
Carbohydrate	> 55%[1]	66.6	64.8	63.0	64.9
Mean Amount					
Cholesterol (mg)	≤ 75[1]	13.1	14.2	12.2	14.3
Sodium (mg)	≤ 600[1]	566.8	497.4	360.9	505.9
Dietary Fiber (gm)	–[2]	4.8	3.8	2.2	3.9
Number of Schools		17	17	1	16

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.

[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-103

Mean Nutrient Profile of Breakfasts Served by School Type, District E

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	22.6	22.7	22.7	22.7
Protein	25%	52.4	51.9	53.1	51.6
Vitamin A	25%	68.6	69.7	70.7	69.5
Vitamin C	25%	66.4	73.4	78.3	72.3
Calcium	25%	52.0	51.3	51.3	51.4
Iron	25%	52.5	54.2	54.8	54.1
Percent of Food Energy from:					
Total fat	≤ 30%	23.3	22.5	22.7	22.4
Saturated fat	< 10%	7.5	7.1	7.9	7.0
Carbohydrate	> 55%[1]	65.1	66.1	65.4	66.2
Mean Amount					
Cholesterol (mg)	≤ 75[1]	26.8	24.6	26.2	24.3
Sodium (mg)	≤ 600[1]	494.5	506.5	517.0	504.1
Dietary Fiber (gm)	–[2]	2.0	2.1	2.1	2.1
Number of Schools		27	32	6	26

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.

[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-104

Mean Nutrient Profile of Breakfasts Served by School Type, District F

	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
As Percent of 1989 RDA:					
Food Energy	25%	24.6	25.4	25.4	na[3]
Protein	25%	49.0	48.7	48.7	na
Vitamin A	25%	31.0	25.5	25.5	na
Vitamin C	25%	42.2	39.0	39.0	na
Calcium	25%	32.5	36.5	36.5	na
Iron	25%	28.9	26.1	26.1	na
Percent of Food Energy from:					
Total fat	≤ 30%	34.8	30.6	30.6	na
Saturated fat	< 10%	11.5	9.9	9.9	na
Carbohydrate	> 55%[1]	53.9	58.6	58.6	na
Mean Amount					
Cholesterol (mg)	≤ 75[1]	48.2	29.2	29.2	na
Sodium (mg)	≤ 600[1]	729.9	689.4	689.4	na
Dietary Fiber (gm)	_[2]	1.9	2.0	2.0	na
Number of Schools		5	5	5	0

RDA = Recommended Dietary Allowance
na = not applicable

[1] National Research Council (NRC) recommendation, not School Breakfast Program (SBP) standard.
[2] Recommendations for dietary fiber have not typically been applied to analyses of school meals.
[3] Schools in District F did not serve breakfast in locations other than the classroom.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-105

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, All Districts

			Treatment Schools		
Dietary Component	**Standard/ Recommendation**	**Control Schools**	**All**	**Classroom**	**Non-classroom**
Food Energy	25% of 1989 RDA	17.8	9.0	16.7	6.7
Protein	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin A	25% of 1989 RDA	95.9	94.9	83.3	98.3•
Vitamin C	25% of 1989 RDA	95.9	93.6	83.3	96.7•
Calcium	25% of 1989 RDA	98.6	97.4	94.4	98.3
Iron	25% of 1989 RDA	94.5	91.0	83.3	93.3
Percent of Food Energy from:					
Total fat	≤ 30%	87.7	92.3	83.3	95.0
Saturated fat	≤ 10%	86.3	83.3	72.2	86.7
Carbohydrate	>55%[1]	91.8	93.6	88.9	95.0
Cholesterol (mg)	≤ 75[1]	100.0	98.7	100.0	98.3
Sodium (mg)	≤ 600[1]	75.3	83.3	72.2	86.7
Number of Schools		73	78	18	60

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not SBP standard.

- Difference is statistically significant at the .05 level. Comparisons are between control and treatment schools and between classroom and non-classroom treatment schools.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-106

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, District A

Dietary Component	Standard/ Recommendation	Control Schools	Treatment Schools		
			All	Classroom	Non-classroom
Food Energy	25% of 1989 RDA	75.0	62.5	33.3	80.0
Protein	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin A	25% of 1989 RDA	100.0	87.5	100.0	80.0
Vitamin C	25% of 1989 RDA	100.0	87.5	100.0	80.0
Calcium	25% of 1989 RDA	100.0	87.5	100.0	80.0
Iron	25% of 1989 RDA	100.0	100.0	100.0	100.0
Percent of Food Energy from:					
Total fat	≤ 30%	37.5	50.0	66.7	40.0
Saturated fat	≤ 10%	37.5	50.0	66.7	40.0
Carbohydrate	>55%[1]	62.5	50.0	66.7	40.0
Cholesterol (mg)	≤ 75[1]	100.0	87.5	100.0	80.0
Sodium (mg)	≤ 600[1]	12.5	12.5	0.0	20.0
Number of Schools		8	8	3	5

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not SBP standard.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-107

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, District B

			Treatment Schools		
Dietary Component	**Standard/ Recommendation**	**Control Schools**	**All**	**Classroom**	**Non-classroom**
Food Energy	25% of 1989 RDA	16.7	0.0	0.0	0.0
Protein	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin A	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin C	25% of 1989 RDA	75.0	75.0	33.3	88.9
Calcium	25% of 1989 RDA	100.0	100.0	100.0	100.0
Iron	25% of 1989 RDA	100.0	100.0	100.0	100.0
Percent of Food Energy from:					
Total fat	≤ 30%	100.0	100.0	100.0	100.0
Saturated fat	≤ 10%	100.0	83.3	33.3	100.0
Carbohydrate	>55%[1]	100.0	100.0	100.0	100.0
Cholesterol (mg)	≤ 75[1]	100.0	100.0	100.0	100.0
Sodium (mg)	≤ 600[1]	91.7	91.7	100.0	88.9
Number of Schools		12	12	3	9

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not SBP standard.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-108

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, District C

			Treatment Schools		
Dietary Component	**Standard/ Recommendation**	**Control Schools**	**All**	**Classroom**	**Non-classroom**
Food Energy	25% of 1989 RDA	0.0	0.0	na[2]	0.0
Protein	25% of 1989 RDA	100.0	100.0	na	100.0
Vitamin A	25% of 1989 RDA	75.0	100.0	na	100.0
Vitamin C	25% of 1989 RDA	100.0	100.0	na	100.0
Calcium	25% of 1989 RDA	100.0	100.0	na	100.0
Iron	25% of 1989 RDA	50.0	100.0	na	100.0
Percent of Food Energy from:					
Total fat	≤ 30%	100.0	100.0	na	100.0
Saturated fat	≤ 10%	75.0	50.0	na	50.0
Carbohydrate	>55%[1]	100.0	100.0	na	100.0
Cholesterol (mg)	≤ 75[1]	100.0	100.0	na	100.0
Sodium (mg)	≤ 600[1]	100.0	100.0	na	100.0
Number of Schools		4	4	0	4

RDA = Recommended Dietary Allowance

na = not applicable.

[1] National Research Council (NRC) recommendation, not SBP standard.

[2] Schools in District C did not serve breakfast in the classroom.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-109

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, District D

			Treatment Schools		
Dietary Component	**Standard/ Recommendation**	**Control Schools**	**All**	**Classroom**	**Non-classroom**
Food Energy	25% of 1989 RDA	5.9	0.0	0.0	0.0
Protein	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin A	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin C	25% of 1989 RDA	100.0	100.0	100.0	100.0
Calcium	25% of 1989 RDA	100.0	100.0	100.0	100.0
Iron	25% of 1989 RDA	100.0	70.6	0.0	75.0
Percent of Food Energy from:					
Total fat	≤ 30%	100.0	100.0	100.0	100.0
Saturated fat	≤ 10%	100.0	82.4	100.0	81.3
Carbohydrate	>55%[1]	100.0	100.0	100.0	100.0
Cholesterol (mg)	≤ 75[1]	100.0	100.0	100.0	100.0
Sodium (mg)	≤ 600[1]	76.5	88.2	100.0	87.5
Number of Schools		17	17	1	16

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not SBP standard.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-110

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, District E

			Treatment Schools		
Dietary Component	**Standard/ Recommendation**	**Control Schools**	**All**	**Classroom**	**Non-classroom**
Food Energy	25% of 1989 RDA	7.4	0.0	0.0	0.0
Protein	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin A	25% of 1989 RDA	100.0	100.0	100.0	100.0
Vitamin C	25% of 1989 RDA	100.0	100.0	100.0	100.0
Calcium	25% of 1989 RDA	100.0	100.0	100.0	100.0
Iron	25% of 1989 RDA	100.0	100.0	100.0	100.0
Percent of Food Energy from:					
Total fat	≤ 30%	100.0	100.0	100.0	100.0
Saturated fat	≤ 10%	100.0	100.0	100.0	100.0
Carbohydrate	>55%[1]	100.0	100.0	100.0	100.0
Cholesterol (mg)	≤ 75[1]	100.0	100.0	100.0	100.0
Sodium (mg)	≤ 600[1]	96.3	96.9	100.0	96.2
Number of Schools		27	32	6	26

RDA = Recommended Dietary Allowance

[1] National Research Council (NRC) recommendation, not SBP standard.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

Exhibit A-111

Proportion of Schools in Which the Average Breakfast Meets SBP Nutrition Standards and NRC Recommendations, District F

			Treatment Schools		
Dietary Component	**Standard/ Recommendation**	**Control Schools**	**All**	**Classroom**	**Non-classroom**
Food Energy	25% of 1989 RDA	40.0	40.0	40.0	na[2]
Protein	25% of 1989 RDA	100.0	100.0	100.0	na
Vitamin A	25% of 1989 RDA	60.0	40.0	40.0	na
Vitamin C	25% of 1989 RDA	100.0	80.0	80.0	na
Calcium	25% of 1989 RDA	80.0	80.0	80.0	na
Iron	25% of 1989 RDA	60.0	60.0	60.0	na
Percent of Food Energy from:					
Total fat	≤ 30%	20.0	60.0	60.0	na
Saturated fat	≤ 10%	20.0	60.0	60.0	na
Carbohydrate	>55%[1]	40.0	80.0	80.0	na
Cholesterol (mg)	≤ 75[1]	100.0	100.0	100.0	na
Sodium (mg)	≤ 600[1]	0.0	60.0	60.0	na
Number of Schools		5	5	5	0

RDA = Recommended Dietary Allowance

na = not applicable

[1] National Research Council (NRC) recommendation, not SBP standard.

[2] Schools in District F did not serve breakfast in locations other than the classroom.

Source: Implementation Study – Breakfast Menu Survey, Spring 2001

APPENDIX B

DEMOGRAPHIC CHARACTERISTICS OF THE IMPACT STUDY STUDENT SAMPLE

List of Exhibits

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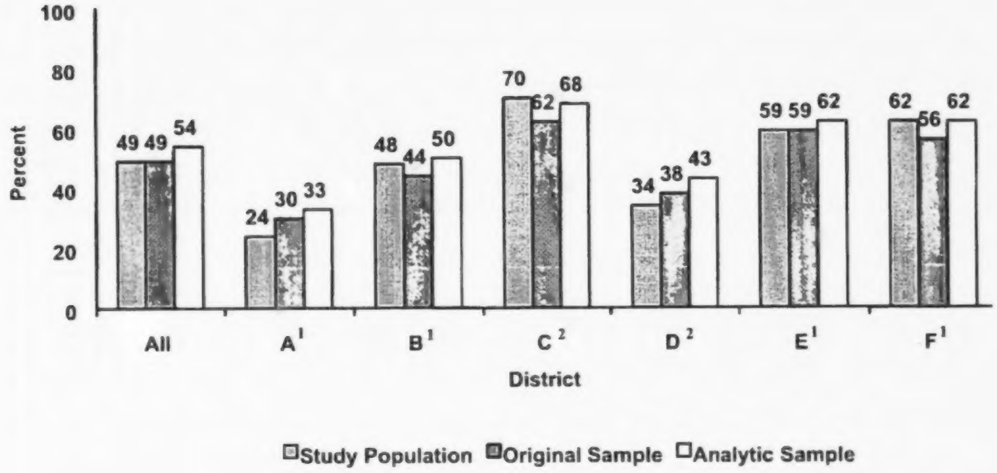
Exhibit B-1

Free/Reduced Price Eligibility in Population and Sample



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[1] Based on student-level data.

[2] Based on school-level data.

Source: School District Files, SY 1999-2000; School Rosters including School Meal Eligibility Status, SY 2000-2001

Exhibit B-2

Differences between Treatment and Control Students on Student's School Meal Eligibility Status[1]

District	Treatment Schools		Control Schools		Difference	Odds Ratio
	N	%	N	%		
All	2221	53.94	2077	53.97	0.28	1.01
A	184	32.07	154	34.42	-2.35	0.90
B	403	50.12	353	49.01	1.12	1.05
C	122	79.51	121	76.86	2.65	1.17
D	520	42.88	503	43.14	-0.26	0.99
E	843	62.16	824	62.01	0.14	1.01
F	149	62.42	122	60.66	1.76	1.08

[1] Based on percent of students categorized as free or reduced-price eligibility status.

Sources: School Records, SY 1999-2000, 2000-2001; Impact Study – Parent Survey, Spring 2001

Exhibit B-3

Differences between Treatment and Control Students on Student's Ethnicity[1]

District	Treatment Schools N	Treatment Schools %	Control Schools N	Control Schools %	Difference	Odds Ratio
All	2221	37.78	2077	37.89	0.34	1.01
A	184	16.30	154	17.53	-1.23	0.92
B	403	41.19	353	41.36	-0.17	0.99
C	122	70.49	121	71.90	-1.41	0.93
D	520	15.77	503	15.51	0.26	1.02
E	843	51.96	824	50.73	1.23	1.05
F	149	24.83	122	25.41	-0.58	0.97

[1] Based on percent of students categorized as non-white ethnicity.

Sources: School Records, SY 2000-2001; Impact Study – Parent Survey, Spring 2001

Exhibit B-4

Differences between Treatment and Control Students on Student's Gender[1]

District	Treatment Schools		Control Schools		Difference	Odds Ratio
	N	%	N	%		
All	2221	52.59	2077	51.32	1.34	1.06
A	184	45.65	154	52.60	-6.95	0.76
B	403	51.36	353	49.58	1.79	1.07
C	122	53.28	121	53.72	-0.44	0.98
D	520	53.85	503	46.52	7.33*	1.34
E	843	54.21	824	54.13	0.08	1.00
F	149	50.34	122	53.28	-2.94	0.89

[1] Based on percent of female students.

* Difference is statistically significant at the .05 level.

Sources: School Records, SY 2000-2001; Impact Study – Child Behavior Survey, Spring 2001

Exhibit B-5

Differences between Treatment and Control Students on Student's Age[1]

District	Treatment Schools N	Treatment Schools Mean	Control Schools N	Control Schools Mean	Difference	Effect Size
All	2221	9.83	2077	9.79	0.03	0.02
A	184	9.82	154	9.65	0.17	0.16
B	403	10.21	353	9.99	0.23*	0.17
C	122	9.81	121	9.93	-0.12	-0.09
D	520	10.11	503	10.04	0.06	0.04
E	843	9.43	824	9.48	-0.05	-0.04
F	149	10.13	122	10.31	-0.18	-0.13

[1] Based on mean age in years. Age was calculated by subtracting date of birth from the date of impact study testing.

* Difference is statistically significant at the .05 level.

Sources: School Records, SY 2000-2001; Impact Study, 24-hour Dietary Recall Interview, Spring 2001

Exhibit B-6

Differences between Treatment and Control Students on Respondent's Education (Less Than a High School Degree)[1]

District	Treatment Schools N	Treatment Schools %	Control Schools N	Control Schools %	Difference	Odds Ratio
All	1731	10.86	1677	10.67	0.27	1.03
A	155	11.61	127	5.51	6.10	2.25
B	260	10.38	267	12.36	-1.97	0.82
C	98	36.73	97	51.55	-14.81*	0.55
D	444	4.95	423	4.96	-0.01	1.00
E	648	10.96	668	8.53	2.42	1.32
F	126	11.11	95	11.58	-0.47	0.95

[1] Based on percent of respondents that did not graduate from high school.

* Difference is statistically significant at the .05 level.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit B-7

Differences between Treatment and Control Students on Respondent's Education (College Degree)[1]

District	Treatment Schools N	Treatment Schools %	Control Schools N	Control Schools %	Difference	Odds Ratio
All	1731	24.15	1677	23.20	0.97	1.05
A	155	31.61	127	27.56	4.05	1.22
B	260	23.46	267	17.98	5.48	1.40
C	98	10.20	97	11.34	-1.14	0.89
D	444	33.56	423	32.62	0.93	1.04
E	648	20.83	668	22.01	-1.17	0.93
F	126	11.11	95	10.53	0.58	1.06

[1] Based on percent of respondents with a college degree or above.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit B-8

Differences between Treatment and Control Students on Family Status[1]

District	Treatment Schools		Control Schools		Difference	Odds Ratio
	N	%	N	%		
All	1731	24.73	1677	24.33	0.65	1.04
A	155	21.29	127	19.69	1.61	1.10
B	260	21.54	267	20.22	1.31	1.08
C	98	26.53	97	22.68	3.85	1.23
D	444	19.82	423	22.46	-2.64	0.85
E	648	31.17	668	28.74	2.43	1.12
F	126	18.25	95	21.05	-2.80	0.84

[1] Based on percent of students in families categorized as single-parent families.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit B-9

Differences between Treatment and Control Students on Household Income (Less than $20K per Year)[1]

District	Treatment Schools		Control Schools		Difference	Odds Ratio
	N	%	N	%		
All	1731	17.16	1677	17.89	-0.72+	0.95
A	155	14.84	127	7.09	7.75*	2.28
B	260	12.69	267	11.99	0.71	1.07
C	98	19.39	97	26.80	-7.42	0.66
D	444	12.39	423	17.97	-5.58*	0.65
E	648	21.60	668	19.61	1.99	1.13
F	126	21.43	95	27.37	-5.94	0.72

[1] Based on percent of students in families with household income less than 20k.

* Difference is statistically significant at the .05 level.
+ District-by-treatment interaction is statistically significant at the .05 level.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit B-10

Differences between Treatment and Control Students on Household Income (Greater than $70K per Year)[1]

District	Treatment Schools N	Treatment Schools %	Control Schools N	Control Schools %	Difference	Odds Ratio
All	1731	20.16	1677	20.75	-0.81	0.95
A	155	34.19	127	30.71	3.48	1.17
B	260	21.54	267	21.35	0.19	1.01
C	98	11.22	97	7.22	4.01	1.63
D	444	30.63	423	27.42	3.21	1.17
E	648	12.35	668	17.51	-5.17**	0.66
F	126	10.32	95	12.63	-2.31	0.80

[1] Based on percent of students in families with household income greater than 70k.

** Difference is statistically significant at the .01 level.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit B-11

Differences between Treatment and Control Students on Student's Health Problems[1]

District	Treatment Schools N	Treatment Schools %	Control Schools N	Control Schools %	Difference	Odds Ratio
All	1731	19.01	1676	20.11	-1.00	0.94
A	155	16.13	127	16.54	-0.41	0.97
B	260	23.08	267	22.47	0.61	1.04
C	98	14.29	97	9.28	5.01	1.63
D	444	17.79	423	18.68	-0.88	0.94
E	648	19.60	667	22.49	-2.89	0.84
F	126	19.05	95	18.95	0.10	1.01

[1] Based on percent of students with a chronic health problem.

Source: Impact Study – Parent Survey, Spring 2001

APPENDIX C

STATISTICAL MODELS USED TO ASSESS IMPACTS

List of Exhibits

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Appendix C

Statistical Models Used to Assess Impacts of Availability of Universal-Free School Breakfast

This section of the appendix describes in detail the statistical models used to assess impacts reported on for this evaluation. We first present various models for assessing student-level impacts, followed by a series of models for assessing school-level impacts.

Models for Student-Level Outcomes

Models for Gain Scores

This section describes the models that were used for analyses of student-level gain scores. These models were used for the analyses of gains on achievement test scores[1], breakfast participation, and measures of attendance and tardiness. For each outcome measure (e.g., a student achievement gain score), three types of models were fit to the data:

- A treatment main effects model;
- A district-by-treatment interaction model; and
- A separate main effects model for data from each of the six districts.

In the text that follows, we will describe the first type of model in the greatest detail. Subsequently, we provide brief discussions of how the latter two differ from the first.

The Treatment Main Effects Model

The student-level data used in this evaluation were based on hierarchically nested clusters. In many applications, observations within clusters are correlated, because the outcome measures of units within a cluster tend to be more similar than those of units in different clusters. Such correlation, if unaccounted for, can violate independent assumptions of standard statistical models and can therefore threaten their internal validity. The lowest level of clustering involves repeated observations on students. Each student had a pre-implementation, or baseline score, and a test score from the following year, the implementation year. The next level of clustering involves students within schools. It is often found that there is a correlation among the scores of students within a school. Next, schools are clustered into treatment-control pairs. The schools comprising the treatment-control pair were specifically chosen to be similar to one another, as part of the randomization process. In most cases the treatment-control pairs were comprised of just two schools, one treatment school and one control school. In a few cases, two or three treatment schools were matched to one or more control schools. Finally, the treatment-control pairs were nested within school districts.

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[1] The models described here for achievement gains correspond to analyses of student gains from one particular grade level to the next (e.g., students that went from third to fourth grade during the time span from pre-implementation to the implementation year). The model for data from all grade levels combined is described in a subsequent section.

In the modeling approach described below, the clustering of repeated observations within students is accounted for by converting the two observations into a single outcome variable, a gain score. The model accounts for clustering of students within each of the two halves of a treatment-control pair. For most of the treatment-control pairs, since there is only one treatment and one control school in the pair, the strategy of accounting for clustering of students within pairs is equivalent to accounting for clustering of students within schools. For those few pairs with more than one treatment school or more than one control school, the clustering within pairs is accounted for, but the clustering within schools is ignored. This omission is expected to have little effect on the estimates or their standard errors.[2] The clustering of students within pairs is accounted for in the models by random effect terms for pairs. The clustering of pairs within districts is accounted for by the use of fixed effects dummy-coded variables for districts. The two-level hierarchical linear model is shown below.

$$gain_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(pre_{ij}) + \beta_3(elig_{ij}) + \beta_4(Minority_{ij}) + \beta_5(female_{ij})$$
$$+ \beta_6(age_{ij}) + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01} + \alpha_{1j}$$

where,

$gain_{ij}$ = the gain score of the i^{th} student in the j^{th} school-pair, and is calculated by subtracting the student's pre-implementation score (pre_{ij}) from the same student's score during the implementation year;

trt_j = a dummy variable indicating whether the school in the j^{th} pair is a treatment school ($trt_j = 1$) or a comparison school ($trt_j = 0$);

$elig_{ij} = 1$ if the i^{th} student in the j^{th} school-pair was eligible for free or reduced-price lunch during the pre-implementation year, and $elig_{ij} = 0$ otherwise;

$Minority_{ij} = 1$ if the i^{th} student in the j^{th} school-pair is non-white, and $Minority_{ij} = 0$ otherwise;

$female_{ij} = 1$ if the i^{th} student in the j^{th} school-pair is female, and $female_{ij} = 0$ otherwise;

age_{ij} = the age (in years) of the i^{th} student in the j^{th} school-pair at the time of the pre-implementation assessment;

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[2] To test this hypothesis, an alternative model was fitted, whereby students were nested within schools, and schools nested within pairs. This model yields very similar estimates of the fixed effects and their standard errors compared to the model illustrated here. For example, in this alternative formulation of the model, the main treatment effect is equal to 2.14 with a standard error equal to 2.21 compared to corresponding estimates of 2.29 and 2.18 in the original model. Moreover, in the alternative model, there was not significant variation in the treatment effect among schools in the pair, implying that clustering within pairs was equivalent to clustering within schools.

$\sum_{k=1}^{5}(District_k)$ represents five dummy coded variables for the six school districts;

and,

ε_{ij} = the student-level residual of the i^{th} student in the j^{th} school-pair. The assumed distribution of these residuals is normal, with mean = 0, and variance = σ^2.

Note that the fixed effects parameter γ_{00} represents the grand mean intercept, and the random effects parameters α_{0j} represent the deviation of the j^{th} school-pair from the grand mean intercept. The grand mean intercept in this model can be interpreted as the mean of the control school means, after controlling for the other terms in the model. More accurately, α_{0j} represents the deviation of the control school mean in the j^{th} school-pair from the grand mean of all control schools. The assumed distribution of the α_{0j} is normal, with mean=0, and variance = τ_{00}^2.

Each pair of schools has its own treatment effect, which is simply the difference between the treatment school mean and the control school mean. The parameter γ_{01}, represents the grand mean treatment effect; that is, the mean of treatment effects over all school-pairs, after controlling for the other terms in the model. The term α_{1j} represents the difference between the treatment effect in the j^{th} school-pair, and the grand mean treatment effect. The assumed distribution of the α_{1j} is normal, with mean = 0, and variance = τ_{11}^2. In these models, the covariance between the random deviations from the grand mean intercept and the deviations from the grand mean treatment effect was not estimated, i.e., the assumed covariance between α_{0j} and α_{1j} was zero. An additional model assumption is that the ε_{ij} are independent of the α_{0j} and α_{1j}.

An Example

In this section, an example is provided for the model specified above, fitted to data on math score gains of students who were in fourth grade during the baseline year and were in fifth grade during the implementation year. The hierarchical linear model (HLM) was fit to the data using the "mixed procedure" of SAS Version 8 software. The parameter estimates are shown in Exhibit C-1.

The intercept estimate is the expected mean gain when all of the other terms in the model are zero (i.e., pre-implementation score =0, treatment = 0, eligibility = 0, minority = 0, female = 0, deviation age = 0, and each of the five district dummy variables = 0). Since none of the students had a pre-implementation score of zero, the intercept estimate, 196.3, cannot be interpreted on its own. In actuality, the average pre-implementation score among the students in this analysis was 637. If the intercept estimate is added to the product of the coefficient for *pre* and the mean for *pre*, [(193.6 + (637*-.28)) = 15.2], with all of the other terms set to zero, the expected mean gain is estimated for students who are in the control group, paid eligibility status, white, male in District F, who are at the average age for their class, and who had an average pre-implementation score.

Exhibit C-1 indicates that the pre-implementation score (labeled "pre_{ij}" in the table) has a relationship to the gain score that is statistically significant at $p < .0001$. The parameter estimate is a negative value. This indicates that, on average, students that had higher pre-implementation scores tended to gain less than students with lower baseline scores.

Exhibit C-1

Model Results: Student-Level Fourth Grade to Fifth Grade Math Gain

	Solution for Fixed Effects					
Model Name	**Effect**	**Estimate**	**S.E.**	**DF**	**t Value**	**Pr > |t|**
	Intercept	196.30	19.11	59	10.27	<.0001
pre_{ij}	TOTMATH_SS	-0.28	0.03	470	-9.64	<.0001
$\sum_{k=1}^{5}(District_k)$	Distid A	3.11	5.61	470	0.55	0.581
	Distid B	8.40	3.94	470	2.13	0.033
	Distid C	11.21	5.72	470	1.96	0.050
	Distid D	4.05	5.88	470	0.69	0.491
	Distid E	14.71	3.30	470	4.45	<.0001
trt_j	cv_trcn	2.29	2.18	58	1.05	0.296
$elig_{ij}$	cv2_eliga	-4.93	2.16	470	-2.28	0.023
$Minority_{ij}$	cv2_eth	-0.92	2.26	470	-0.41	0.686
$female_{ij}$	cv2_gender	1.66	1.99	470	0.84	0.403
age_{ij}	cv2_age	-3.22	2.71	470	-1.19	0.236

	Covariance Parameter Estimates					
	Cov Parm	**Subject**	**Estimate**	**S.E.**	**Z Value**	**Pr Z**
α_{0j}	Intercept	Pair	25.9431	18.7508	1.38	0.0832
α_{1j}	cv_trcn	Pair	47.4446	38.6739	1.23	0.1093
ε_{ij}	Residual		548.3517	35.1733	15.59	<.0001

Exhibit C-1 further shows parameter estimates for the five dummy variables corresponding to five of the six districts. The five districts shown are each contrasted to the sixth. The results indicate that Districts B and E each had higher average gains than District F ($p < .05$). Not shown in Exhibit C-1, are the results of an overall F-test of the null hypothesis of no variation among districts in intercepts (average gains). The hypothesis was rejected in favor of the alternative that there is variation among districts in average gain.

Exhibit C-1 shows that the main effect of treatment (*Trt*) is 2.29 gain score points and is not statistically significant at $p < .05$. The coefficient, 2.29 means that the average treatment effect across all of the treatment pairs, after controlling for the other terms in the model, was 2.29 points. In other words, treatment schools gained an average of 2.29 points more than control group schools (after controlling for other factors), but it would not be unusual to find a difference of this size, even if the true, underlying mean gains were equal.

The variation in impacts among pairs is indicated in Exhibit C-1 by the estimate of the variance of the random effects for impacts (α_{1j}, estimated variance = 47.4). Note that, even after accounting for some of the student-level variation with the student-level covariates (e.g., age, gender, pre-implementation score, school meal eligibility status, ethnicity), the amount of total variation that is accounted for by differences among school-pairs is quite small compared to the student-level residual variation. Examination of the covariance parameter estimates in Exhibit C-1 indicates that school pairings account for about 12 percent of the total residual variation [(25.9 + 47.4) / (25.9 + 47.4 + 548.3) = 0.12].

The results in Exhibit C-1 indicate that students that were eligible for free or reduced-price school meals had average gains that were 4.93 points lower than those of students who were eligible for paid meals. There were no significant differences in gains, however, by ethnicity, gender, or age.

Choice of Covariates

There are two reasons to add covariates to a model such as the one specified above. The first is to control for differences between student characteristics in the control and treatment schools. The second is to reduce residual variance and hence increase the power to detect a main effect of treatment. In a true randomized design, the first reason is often not very important because the randomization often results in balanced distributions of student characteristics between control and treatment schools. In the current study, in which entire schools within school-pairs were randomly assigned to control or treatment, there existed some potential for imbalance on student characteristics between the two groups. But analyses of the demographic characteristics of students in control and treatment groups indicated the randomization process appears to have worked well (see Chapter Five and Appendix B). So, in the current study, the first reason given for adding covariates to the model might not be of crucial importance in terms of inferences to the treatment impact.

The second reason for including covariates is perhaps more important to the current analyses. The student-level covariates used in the model (pre-implementation score, eligibility status, minority status, gender, age) were utilized because they were available for all students, they were not highly correlated with one another, and they could be reasonably expected to account for some of the residual variation among students. There were some other student-level variables available that were obtained from the parent survey, but they were not available for substantial proportions of students that had test scores. Therefore, gains in precision would be offset by loss of sample size if they were included in the models.

The use of school-level covariates in models like the one specified above were explored. However, it was found that the available variables were either the same as or highly correlated with the factors on which the original randomization was based. Thus, within pairs, there was practically no variation on the school-level measures. It was found that adding them to the models more often resulted in estimation problems than in any appreciable reduction in residual variance. Therefore any school-level covariates were not included in the models.

The District-by-Treatment Interaction Model

The second model to be fit for each gain score was the district-by-treatment interaction model. The level 1 model was identical to the one specified above for the main effects model:

$$gain_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(pre_{ij}) + \beta_3(elig_{ij}) + \beta_4(Minority_{ij}) + \beta_5(female_{ij})$$
$$+ \beta_6(age_{ij}) + \varepsilon_{ij}$$

On the other hand, the level 2 model included a district dummy variable interacted with the treatment dummy (see β_{1j}):

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01} + \sum_{k=1}^{5} \gamma_{1k}(District_k) + \alpha_{1j}$$

In these models, an F-test was computed to determine whether there was significant variation among districts in the treatment effect. Rejection of the null hypothesis would imply that the average treatment impact was significantly larger in some districts than in others. This finding would warrant further investigation into the magnitude of the variation in treatment effects among districts. We presented descriptive statistics and estimated impacts for each district.

The Main Effect Model for Each District

We fit separate models to the data for each individual school district. The models were the same as the main effects model previously specified, except that there were no dummy variables for districts.

Level 1 model:

$$gain_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(pre_{ij}) + \beta_3(elig_{ij}) + \beta_4(Minority_{ij}) + \beta_5(female_{ij})$$
$$+ \beta_6(age_{ij}) + \varepsilon_{ij}$$

Level 2 model:

$$\beta_{0j} = \gamma_{00} + \alpha_{0j}$$
$$\beta_{1j} = \gamma_{01} + \alpha_{1j}$$

The Summary Tables

The summary table for the current example, math gain scores of students that were in fourth grade during the baseline year and fifth grade during the implementation year, is shown in Exhibit C-2. The impact shown for "All" districts is 2.29. If the impact main effect had been significantly different than zero, this result would have been indicated with a "*" ($p < .05$) or "**" ($p < .01$) next to the impact estimate. If the district-by-treatment interaction model had found a significant interaction effect, this result would have been shown next to the impact estimate with a "+" ($p < .05$) or "++" ($p < .01$). The impacts from each of the individual districts were estimated from the models of individual districts, discussed above.

The "unadjusted means" shown in Exhibit C-2 are simple arithmetic means of the baseline scores and the gain scores. They are not estimated from the models, i.e., they have not been adjusted for other terms in the model. For example, the mean gain score shown for students in treatment schools is simply the mean gain of all students in treatment schools.

The effect size represents the impact estimate divided by the standard deviation of the pre-implementation scores of both control and treatment school students, combined.

Exhibit C-2

Student-Level Fourth Grade to Fifth Grade Math Gain

	Unadjusted Means						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Yr 1	Gain	N	Yr 1	Gain	Impact	Effect Size
All	299	635.40	25.98	300	638.73	23.76	2.29	0.06
A	22	624.41	37.91	12	647.83	19.00	22.53	0.54
B	56	633.18	27.52	40	635.15	24.58	5.26	0.14
C	16	626.94	27.81	18	607.72	25.67	-6.62	-0.15
D	73	634.60	16.72	66	637.42	18.32	-2.20	-0.07
E	112	639.96	28.07	146	644.14	27.48	-0.22	-0.01
F	20	637.80	29.15	18	632.58	12.97	17.08	0.51

Notes: Yr 1 = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Models for Achievement Gains When Data are Combined Across All Grade Levels

The previously described models for achievement gain were used to analyze achievement gains for a single grade cohort (e.g., students that were assessed in fourth and fifth grades in pre-implementation and implementation years). In this section we describe the models that were used when the data from four grade cohorts were combined in a single analysis (the four cohorts correspond to students that advanced from second to third grade, third to fourth grade, fourth to fifth grade, and fifth to sixth grade). The strategy is essentially the same as that previously described: there was a main effects model, a model to test for district-by-treatment interaction, and separate models fit to the data from each of the six individual districts. The only change to the models was that there were extra dummy-coded terms included to represent the baseline year grade level and terms for interactions between baseline grade level and baseline achievement test score. The form of the main effects model is shown below.

$$\begin{aligned} gain_{ij} &= \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(pre_{ij}) + \beta_3(elig_{ij}) + \beta_4(Minority_{ij}) + \beta_5(female_{ij}) \\ &+ \beta_6(age_{ij}) + \beta_7(bgrade2_{ij}) + \beta_8(bgrade3_{ij}) + \beta_9(bgrade4_{ij}) + \beta_{10}(bgrade5_{ij}) + \\ &\beta_{11}(bgrade2_{ij} * pre_{ij}) + \beta_{12}(bgrade3_{ij} * pre_{ij}) + \beta_{13}(bgrade4_{ij} * pre_{ij}) \\ &+ \beta_{14}(bgrade5_{ij} * pre_{ij}) + \varepsilon_{ij} \end{aligned}$$

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01} + \alpha_{1j}$$

where,

$bgrade2_{ij}$ = 1 if student was in second grade during the baseline year, and 0 otherwise,
$bgrade3_{ij}$ = 1 if student was in third grade during the baseline year, and 0 otherwise,
$bgrade4_{ij}$ = 1 if student was in fourth grade during the baseline year, and 0 otherwise,
$bgrade5_{ij}$ = 1 if student was in fifth grade during the baseline year, and 0 otherwise,

and, the other terms are as previously described.

Models for the district-by-treatment interaction and the models for data from each individual district also included these extra dummy-coded terms. The rationale for the extra dummy-coded terms and interaction is as follows. The outcome measures are achievement test gains, where the metric used was scale scores on the Stanford-9 test. There is no a priori reason to expect that the average gains of the four grade cohorts should be equivalent. For example, if one examines the summary tables for reading gains, it is evident that, on average, students advancing from second to third grade made bigger gains than students advancing from fourth to fifth grades. The dummy variables for baseline grade allow for different average gain scores for the four grade cohorts in the combined model. Furthermore, there was evidence that the relationship between students' pre-implementation score (pre) and gain varied across the grade cohorts. Therefore, the grade cohort dummies were interacted with the pre-test score to allow for different slopes for the pre-implementation score in each of the four grade cohorts.

Models for Continuous Outcome Measures at a Single Time Point

Many of the outcome variables were measured only at one time point during the implementation year. Examples include measures of cognitive functioning, student behavior, and food insecurity. The models fit to these outcome measures were the same as those specified for the gain scores, with the following exceptions:

- The outcome measure is an implementation year measurement, rather than a gain score;
- There is no pre-implementation score used as a covariate; and
- The standard deviation used in the calculation of effect sizes is the pooled standard deviation of treatment and comparison group students on the implementation year outcome measure.

Thus, the model specification for the main effects model is as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(elig_{ij}) + \beta_3(Minority_{ij}) + \beta_4(female_{ij}) + \beta_5(age_{ij}) + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01} + \alpha_{1j}$$

where,

Y_{ij} = the outcome measure of the i^{th} student in the j^{th} school-pair, and the other terms in the model are as previously described.

Models for Binary Outcome Measures at a Single Time Point

The previously described models were used for outcome data that were measured on a continuous scale (either gain scores or implementation year scores). Those models are often not a good choice for outcome measures that are binary (e.g., 1 = "yes", 0 = "no"). The main problem with using simple linear models for binary outcome data is the likelihood that the predicted means (the proportion of "yes" responses) would sometimes be less than zero or greater than one, outside the mathematical limits of a proportion. Additionally, binary data often do not come close to satisfying the normality assumptions of linear models, nor are the assumptions regarding variances justifiable. Hence, the statistical inferences drawn from these models might not be trustworthy.

An example of a binary outcome is psychosocial impairment. The variable takes the value of "1" if a child meets the criteria for psychosocial impairment, and takes the value of "0", otherwise. The research question is whether the proportion of students with psychosocial impairment (in the implementation year) is different for students in control and treatment schools. Logistic regression models are useful analytic tools for answering this type of research question with these kinds of data. However, traditional logistic regression models do not take into account clustering of students within schools and schools within pairs and pairs within districts. To address this issue, the generalized estimating equations (GEE) approach can be utilized. This is an iterative procedure that can be implemented in the GENMOD procedure of SAS to model and account for potential correlation among observations within clusters.

We utilized a GEE approach in which we modeled the correlation among students that are nested within schools. The clustering of schools within districts is accounted for in the model by the district dummy variables. The model, however, does not explicitly take into account the pairing of control and treatment schools, as was done in the HLM models for continuous outcome variables.[3]

The main effects model is of the form:

$$\log\frac{\pi_{ij}}{(1-\pi_{ij})} = \beta_0 + \beta_1(trt_j) + \beta_2(elig_{ij}) + \beta_3(Minority_{ij}) + \beta_4(female_{ij}) + \beta_5(age_{ij})$$

$$+\sum_{k=1}^{5}\beta_{5+k}(District_k)$$

where,

> π_{ij} = the probability that the i^{th} student in the j^{th} school takes the value "1" (rather than "0") on the outcome measure.

Using the typical nomenclature of logistic regression modeling, we will refer to an outcome taking the value "1" as a "success", and an outcome taking the value "0" as a "failure".

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[3] For binary outcomes, models that had fixed or random effects corresponding to the treatment pairs resulted in estimation problems and non-convergence whenever all of the students in one half of a school-pair assumed the same value (i.e., all zeros or all ones). On the other hand, the marginal modeling approach (the GEE approach) does not have this problem unless all students across either all treatment schools or all control schools have the same value on the outcome variable. When this situation arose, modeling is not possible with either the GEE or the HLM modeling approaches, but it suffices to present the results descriptively.

In this model, an overall average treatment effect is estimated. The estimated coefficient for the treatment effect, $\hat{\beta}_1$, is interpreted as the log odds ratio of success (after controlling for the other terms in the model). If we take the exponential of the estimate, $\exp(\hat{\beta}_1)$, we obtain the odds ratio of success. The odds ratio of success is the odds of success in the treatment group, divided by the odds of success in the control group. The odds of success in the treatment group is the probability of success (the proportion of students with psychosocial impairment) in treatment schools divided by the probability of failure of students in treatment schools.

In the summary tables, the odds ratio is shown in the "effect size" column. In the column labeled "impact" we present an estimate of the difference between the probability of success for students in treatment schools and the probability of success of students in control schools (after controlling for the other factors in the model). We used the odds ratio estimated from the model, the definition of an odds ratio, and the proportion of students in control schools who were "successes" to estimate the impact as follows:

The odds ratio is defined as:

$$OR = T/(1-T)\ /\ C/(1-C)$$

where,

T = probability of success for students in treatment schools, and

C = probability of success for students in control schools.

Solving the equation above for T yields:

$$T = (OR * (C/(1-C)))\ /(1 + (OR * (C/(1-C)))).$$

Next, we substitute the value of $\hat{\beta}_1$ for "OR" and the proportion of control group students who were successes (shown in the summary tables in the unadjusted proportions for control group column) for "C" to obtain "T" (the impact of treatment, after controlling for the other terms in the model).

An additional model was fit for each outcome variable to test for a district-by-treatment interaction effect. Finally, separate models were fit to the data from each individual district.

Models for Subgroup Analyses

Models for subgroup analyses were fit to the data to determine whether there were differential treatment impacts for different subgroups. An example research question that can be addressed using these analyses is, "Are the treatment impacts different for students that were eligible for free or reduced-price school meals, relative to the impacts of students that were eligible for paid meals?"

The example model specification shown below builds on the main effects model for gain scores. The only difference from the previous models is the addition of a term for the treatment-by-subgroup interaction (*trt*subgrp*).[4] The key result of interest from this model is the test of whether there is a statistically significant treatment-by-subgroup interaction. A significant treatment-by-subgroup interaction is interpreted as evidence of differential treatment effects for the members of the two subgroups.

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[4] In this model the *subgrp* variable is represented by school meal eligibility status.

$$gain_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(subgrp_{ij}) + \beta_3(trt_j * subgrp_{ij}) + \beta_4(pre_{ij})$$
$$+ \beta_5(Minority_{ij}) + \beta_6(female_{ij}) + \beta_7(age_{ij}) + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01} + \alpha_{1j}$$

A second model adds a three-way interaction between treatment, subgroup and district, and the additional two-way interaction terms that are necessary to fit the three-way interaction (i.e., there are terms for district-by-treatment, district-by-subgroup, and treatment-by-subgroup, in addition to the three-way district-by-treatment-by-subgroup interaction). A significant three-way interaction is interpreted as evidence that there are differential treatment effects between the two subgroups, and these differences in treatment effects vary across districts. For example, in one district there could be a large difference between treatment effects for the two subgroups, and in other districts there might be no differences between the subgroups on the treatment effect.

And as with the previous models, separate models were fit to the data from each individual district. For subgroup analyses for continuous and binary outcomes measured at a single time point, the corresponding previously described models were modified by adding the same set of interaction terms as was described here.

Presentation of Results

In the event of a lack of significant results between the respective impacts on the two groups of students, the best estimate of the respective subgroup means and their impacts will be the means and overall impact for the entire study sample. For this reason, subgroup analyses for non-significant findings will not be presented in tables.[5]

For illustration purposes, we present in Exhibit C-3 how subgroup impacts are displayed in Appendix G. The table mirrors the tables presented for the overall impacts shown in Appendix D. Results are only shown in instances where there is a significant interaction between the subgroup variable and treatment status. In addition, results are only shown at the district level when there is a reported three-way interaction between subgroup, treatment, and district.

In this example, results are shown for the differences between impacts on free/reduced-price eligible students and paid-eligible students for two measures of achievement test score gains. In the first case, focusing on second to third grade math gain, there is an overall interaction effect between school meal eligibility and treatment status. Moreover, the interaction effect varies significantly across districts, implying that the overall effect may not be the best estimate of each district's unique effect.

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[5] A total of 209 subgroup analyses were conducted across all outcomes and the four subgroups: ethnicity, age, gender, and school meal eligibility status.

Exhibit C-3

Academic Achievement Outcomes by School Meal Eligibility Status[1]

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Paid				Free/Reduced						
	Treatment		Control		Treatment		Control				
Measure/District	N	Mean	N	Mean	N	Mean	N	Mean	Paid Impact	Free/ Reduced Impact	Interaction Effect
Math Score Gain, Second to Third Grade											
All	52	31.19 (4.39)	38	18.50 (4.05)	51	19.04 (4.73)	50	29.42 (3.85)	14.94	-6.82	** +
B	47	27.66 (4.28)	36	16.67 (4.04)	32	17.69 (6.11)	32	22.09 (3.84)	12.94	-1.22	n.s.
C	5	64.40 (16.25)	2	51.50 (9.50)	19	21.32 (7.63)	18	42.44 (7.41)	37.78	-4.83	n.s.
Reading Score Gain, Third to Fourth Grade											
All[2]	264	18.14 (2.53)	259	28.35 (2.36)	277	25.01 (2.32)	286	21.55 (1.99)	-8.97•	2.77	*

n.s. = Not significant

[1] All test scores have been converted to Stanford–9 scale scores.

[2] Schools in Districts A, D, E, and F did not administer tests to students in second grade.

* The two-way interaction between treatment and eligibility status is statistically significant at the .05 level.

** The two-way interaction between treatment and eligibility status is statistically significant at the .01 level.

+ The three-way interaction between treatment, eligibility status, and district is statistically significant at the .05 level.

• Difference between treatment and control students is statistically significant at the .05 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Results are thus shown both overall and by district. The reader must use caution, however, in looking at findings at the district level, given the small sample size and the corresponding unreliability of the results. In contrast, when looking at third to fourth grade reading gain, there is only an interaction effect between eligibility and treatment status, with no further interaction by district. In this case, only the overall effects across districts are displayed.

Models for School-Level Outcomes

Models for Change Scores

This section describes the models that were used for analyses of school-level change scores. The modeling approach for school-level change was very similar to that described for the student-level change scores. The main difference is that as opposed to the student-level data, where there were multiple observations on students clustered within schools, the school-level data has just one observation per school. These models were used for the analyses of changes on achievement test scores, breakfast participation, and measures of attendance and tardiness. In the case of achievement scores, the changes correspond to the difference between mean scores for students at a particular grade level (e.g., fourth grade) in the pre-implementation year, and the mean scores for students in the same grade (e.g. fourth grade) obtained during the implementation year. Thus, these models measured "change" for different cohorts of students. For each outcome measure three types of models were fit to the data:

- A treatment main effects model;
- A district-by-treatment interaction model; and
- A separate main effects model for data from each of the six districts.

With only one observation per school, the sample sizes for the analyses for each separate district were very small. Therefore, the results of the third type of model (main effect for each district) were presented for descriptive purposes only. No hypothesis tests were performed using these models.

The school-level main effects models were of the form:

$$change_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \beta_2(pre_{ij}) + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01}$$

where,

> *change*$_{ij}$ = the change score of the i^{th} school in the j^{th} school-pair, calculated by subtracting the school's pre-implementation score (pre_{ij}) from the same school's score during the implementation year ($post_{ij}$).

An example of a pre-implementation score is a school-level mean math score of fourth grade students (expressed as a national normal curve equivalent). The implementation year score represents the school-level mean math score of fourth grade students (expressed as a national normal curve equivalent) during the implementation year.

trt_j = a dummy variable indicating whether the school in the j^{th} pair is a treatment school ($Trt_j = 1$) or a comparison school ($trt_j = 0$).

$\sum_{k=1}^{5}(District_k)$ represents five dummy variables for the six school districts.

ε_{ij} = the school-level residual of the i^{th} school in the j^{th} school-pair. The assumed distribution of these residuals is normal, with mean = 0, and variance = σ^2.

The fixed effects parameter γ_{00} represents the grand mean intercept and the random effects parameters α_{0j} represent the deviation of the j^{th} school-pair's intercept from the grand mean intercept. The assumed distribution of the α_{0j} is normal, with mean = 0, and variance = τ_{00}^2. With only two observations per pair (a treatment school and a control school) it is not possible to specify a random treatment effect, (as was done in the models for student-level data). Within pairs, the deviation of the control school from the grand mean of control schools (the grand intercept) is represented by the α_{0j}. The deviation of the treatment school from the grand mean of treatment schools (i.e., the grand mean intercept plus the grand mean treatment effect) is captured by the ε_{ij}.

In order to test for district-by-treatment interactions, the level 2 equation for the treatment effects shown above was replaced by the equation shown below. An F-test was then computed to determine whether there was significant variation among districts in the treatment effect.

$$\beta_{1j} = \gamma_{01} + \sum_{k=1}^{5}\gamma_{1k}(District_k).$$

Attempts to add school-level covariates to the models, specified above, often resulted in estimation problems and non-convergence. An alternative model formulation allowed the addition of covariates without causing the convergence problems. These models, shown below, are ordinary least squares regression models.

$$change_i = \beta_0 + \beta_1(trt_i) + \beta_2(pre_i) + \beta_3(enrollment_i) + \beta_4(attendance_i)$$
$$+ \beta_5(PctFR_i) + \sum_{k=1}^{5}\gamma_k(District_k) + \varepsilon_i$$

where,

$enrollment_i$ = the enrollment of the i^{th} school during the pre-implementation year.

$attendance_i$ = the school-level average daily attendance divided by the school enrollment of the i^{th} school during the pre-implementation year.

$PctFR_i$ = the percent of students eligible for free or reduced-price lunch of the i^{th} school during the pre-implementation year.

As with previous model formulations, additional terms were added to test for district-by-treatment interactions. Finally, in another set of models, the district terms were dropped and separate models were fit to the data to estimate individual districts effects.

The results from these ordinary least squares models with the school-level covariates were generally very similar to the results generated by the models previously described that took into account the pairings of the matched schools (i.e., the random intercept models).[6]

All Grades Combined Models

The previously described models were fit to data corresponding to achievement gains of a single grade level. That is, separate models were fit for second grade, third grade, fourth grade, fifth grade, and sixth grade achievement gain scores. An additional set of models was fit to the data from all grades combined. The set included a main effects model, a district-by-treatment interaction model, and separate models for each district. When data are utilized from all grades in a single model, the data structure becomes such that there are multiple observations within schools (i.e., gains from second, third, fourth, fifth, and sixth), schools nested in pairs, and pairs nested in districts. This structure is similar to that described for disciplinary and health incidents outcomes below. Therefore, models of the same form as those specified in the section on disciplinary and health incidents outcomes were fit to the data for the all grades combined school-level gains with the exception that a pre-implementation measure was also included.

Models for Disciplinary and Health Incidents Outcomes

The disciplinary and health incidents outcomes were measures that were expressed as the number of events in a week per 100 students enrolled in a school. At each school, measurements were taken on multiple occasions during the implementation year. Thus, there are multiple measurements nested within schools, with schools nested in pairs and the pair nested in districts. This data structure is similar to the structure of the student-level data for continuous outcomes at a single time point. Very similar models were fit to these outcomes, except that there are no corresponding demographic covariates as there were for the student-level outcomes. Thus, the model specification for the main effects model is as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(trt_j) + \varepsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^{5} \gamma_{0k}(District_k) + \alpha_{0j}$$

$$\beta_{1j} = \gamma_{01} + \alpha_{1j}$$

---

[6] In addition, a variant of the model in which the dependent variable was expressed as average achievement score and prior achievement was not included as a regressor showed fairly consistent results compared to the school-level model used in this report.

where,

Y_{ij} = the outcome measured on the i^{th} occasion in the j^{th} school-pair.

As with the previous types of outcomes, an additional model was fit to test for a district-by-treatment interaction, and separate models were fit to the data from each individual district.

Adjusting Effects for Non-participation and Crossovers

In order to estimate the effects on participants in school breakfast a statistical correction is used (Bloom, 1984), which adjusts the estimate of impact on the entire treatment group (i.e., the effect of the availability of universal-free school breakfast), including those students who do not receive school breakfast. The adjustment is based on the following formulation, where the impact of school breakfast on the overall treatment group (participants and non-participants) can be expressed as follows:

$$I_t = r^* I_n + (1 - r)^* I_p$$

where,

I_t represents the average overall impact on all sample students enrolled in schools randomly assigned to universal-free school breakfast;

I_n is the average effect on non-participants;

I_p is the average effect on participants (i.e., those students who received school breakfast); and

r is the proportion of the treatment group who are non-participants.

The only assumption needed here is that the program has no impact on students that did not receive a school breakfast, which seems quite reasonable in this case. In other words, the entire observed effect is on the participants in school breakfast. Under this assumption, $I_n = 0$ and the first term of the weighted average drops out, yielding the following as the average overall impact:

$$I_t = (1 - r)^* I_p$$

The average impact on participants, I_p, is then simply equal to:

$$I_t/(1 - r)$$

Thus, the average impact on the entire treatment group divided by the proportion of students who are participants $(1 - r)$ yields an unbiased estimate of the average impact on participants in school breakfast. This correction is used to adjust impact estimates for students receiving breakfast on a typical day.

In fact, control school students are also able to receive school breakfast under the SBP. Thus, in estimating the effects on participants, two separate adjustments need to be made. The first refers to the adjustment described above (i.e., treatment school students who do not participate). In addition, there also needs to be an adjustment for "crossovers" (i.e., control school students who **do** participate). The assumption underlying this second adjustment is that school breakfast has the same effect on control school students who eat it as it does on their (unobservable) counterparts in the treatment school. These two separate adjustments can then be combined by dividing I_t by $(1 - r - c)$, where r is the nonparticipation rate and c is the crossover rate. The impact on participants is thus estimated by adjusting for the *differential* in participation rates between the two groups of students.

The correction is also applied to longer-term outcomes, where participation is measured over the entire school year. In this case, participation in school breakfast is not defined as an "either/or" proposition. It is also possible to apply the Bloom correction by weighting students on a proportional basis as long as the assumption holds that the effect is proportional to the intensity of treatment (i.e., frequency of breakfast receipt). For example, suppose that out of the 30 students in a treatment school, the following participation patterns emerge:

- 10 students receive breakfast every day of the week;
- 10 students receive breakfast one day of the week; and
- 10 students never receive breakfast.

The overall participation rate in this case is $((10)*1 + (10)*(.2) + (10)*(0))/30 = .40$, based on one week of participation. Suppose also that the participation rate for control school students is .20. Under this scenario, the overall impact would be divided by a factor of (.40 - .20) or .20 to estimate the impact on participants in school breakfast.

APPENDIX D

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School Breakfast Participation

Exhibit D-1

Student-Level School Breakfast Participation Gain

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[1]	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	1776	16.36 (0.58)	23.56	1604	16.26 (0.62)	5.43	17.90**++	0.73
A	182	21.28 (1.52)	18.76	149	22.65 (2.41)	2.69	15.85**	0.64
B	327	19.40 (1.55)	23.78	284	19.33 (1.66)	1.41	21.63**	0.77
D	363	8.12 (0.99)	9.12	314	8.05 (1.00)	2.05	6.68**	0.36
E	771	15.94 (0.81)	28.65	752	16.21 (0.83)	8.84	19.75**	0.87
F	133	27.08 (2.91)	39.55	105	23.87 (3.11)	5.87	35.18**	1.07

[1] Complete data were not available for District C.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

** Difference is statistically significant at the .01 level.
++ District-by-treatment interaction is statistically significant at the .01 level.

Source: Impact Study – Student-Level School Breakfast Participation Data, 1999-2000 and 2000-2001

Exhibit D-2

School-Level School Breakfast Participation Gain

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	69	19.33 (1.16)	16.69	69	19.49 (1.21)	0.82	15.88**++	1.62
A	5	26.42 (5.65)	28.17	5	23.76 (4.08)	1.12	26.66	2.54
B	12	18.38 (2.11)	18.49	12	18.73 (2.76)	-0.16	18.58	2.23
C	4	29.69 (3.49)	15.59	4	30.30 (7.00)	-1.15	16.81	1.64
D	17	10.41 (1.48)	7.58	17	10.66 (1.27)	0.38	7.18	1.28
E	27	20.85 (1.47)	16.87	27	21.76 (1.67)	1.53	15.41	1.90
F	4	30.66 (3.97)	35.47	4	27.80 (4.39)	2.29	33.94	4.30

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

** Difference is statistically significant at the .01 level.
++ District-by-treatment interaction is statistically significant at the .01 level.

Source: Impact Study – School-Level School Breakfast Participation Data, 1999-2000 and 2000-2001

Breakfast Consumption

Exhibit D-3

Percent of Students Eating Breakfast on the Target Day, by Breakfast Definition[1]

	Unadjusted Percentages (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District/Breakfast Definition	N	%	N	%	Impact	Odds Ratio
All						
Any food or beverage	2212	96.61 (0.00)	2066	96.37 (0.00)	0.32	1.10
Food from at least 2 main food groups[2] and > 10% RDA for food energy	2212	79.88 (0.01)	2066	75.85 (0.01)	4.18**	1.28
Food from at least 2 main food groups[2] and > 15% RDA for food energy	2212	62.79 (0.01)	2066	59.49 (0.01)	3.53*	1.16
A						
Any food or beverage	181	96.13 (0.01)	153	94.12 (0.02)	2.13	1.61
Food from at least 2 main food groups[2] and > 10% RDA for food energy	181	76.24 (0.03)	153	74.51 (0.04)	1.63	1.09
Food from at least 2 main food groups[2] and > 15% RDA for food energy	181	62.98 (0.04)	153	56.86 (0.04)	6.39	1.31
B						
Any food or beverage	402	95.52 (0.01)	351	94.59 (0.01)	1.32	1.34
Food from at least 2 main food groups[2] and > 10% RDA for food energy	402	78.86 (0.02)	351	74.93 (0.02)	4.91	1.33
Food from at least 2 main food groups[2] and > 15% RDA for food energy	402	55.47 (0.02)	351	59.54 (0.03)	-3.10	0.88
C						
Any food or beverage	120	94.17 (0.02)	121	95.04 (0.02)	-0.55	0.90
Food from at least 2 main food groups[2] and > 10% RDA for food energy	120	74.17 (0.04)	121	70.25 (0.04)	3.71	1.20
Food from at least 2 main food groups[2] and > 15% RDA for food energy	120	59.17 (0.05)	121	51.24 (0.05)	7.50	1.35
D						
Any food or beverage	518	97.49 (0.01)	502	97.61 (0.01)	0.04	1.02
Food from at least 2 main food groups[2] and > 10% RDA for food energy	518	79.92 (0.02)	502	78.49 (0.02)	1.91	1.12
Food from at least 2 main food groups[2] and > 15% RDA for food energy	518	61.78 (0.02)	502	57.57 (0.02)	4.68	1.22
E						
Any food or beverage	842	96.56 (0.01)	821	97.08 (0.01)	-0.55	0.84
Food from at least 2 main food groups[2] and > 10% RDA for food energy	842	80.76 (0.01)	821	76.61 (0.01)	4.07*	1.28
Food from at least 2 main food groups[2] and > 15% RDA for food energy	842	65.56 (0.02)	821	62.97 (0.02)	2.57	1.12
F						
Any food or beverage	149	99.33 (0.01)	118	95.76 (0.02)	3.63*	7.26
Food from at least 2 main food groups[2] and > 10% RDA for food energy	149	86.58 (0.03)	118	69.49 (0.04)	17.40**	2.92
Food from at least 2 main food groups[2] and > 15% RDA for food energy	149	73.15 (0.04)	118	55.08 (0.05)	18.10**	2.22

RDA = Recommended Dietary Allowance

[1] All three definitions of breakfast include all food and beverages, excluding water, reported consumed between 5:00 a.m. and 45 minutes after the start of school and foods consumed up to 10:30 a.m. that the student/parent reported as being part of breakfast.

[2] The five main food groups are: milk and milk products, meat and meat alternates, grain products, fruit and fruit juices, and vegetables and vegetable juices.

- * Difference is statistically significant at the .05 level.
- ** Difference is statistically significant at the .01 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-4

Percent of Students Eating More Than One Breakfast, by Breakfast Definition

	Unadjusted Percentages (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District/Breakfast Definition	N	%	N	%	Impact	Odds Ratio
All						
Any food or beverage	2212	20.66 (0.01)	2066	10.84 (0.01)	10.20**	2.20
Food from at least 2 main food groups[2] and > 10% RDA for food energy	2212	6.96 (0.01)	2066	3.87 (0.00)	3.24**	1.91
Food from at least 2 main food groups[2] and > 15% RDA for food energy	2212	3.35 (0.00)	2066	2.03 (0.00)	1.33**	1.68
A						
Any food or beverage	181	15.47 (0.03)	153	7.84 (0.02)	8.30*	2.26
Food from at least 2 main food groups[2] and > 10% RDA for food energy	181	4.97 (0.02)	153	3.27 (0.01)	1.84	1.59
Food from at least 2 main food groups[2] and > 15% RDA for food energy	181	2.21 (0.01)	153	2.61 (0.01)	-0.34	0.87
B						
Any food or beverage	402	19.15 (0.02)	351	11.68 (0.02)	7.82**	1.83
Food from at least 2 main food groups[2] and > 10% RDA for food energy	402	6.97 (0.01)	351	4.56 (0.01)	2.92	1.69
Food from at least 2 main food groups[2] and > 15% RDA for food energy	402	2.74 (0.01)	351	1.99 (0.01)	1.00	1.52
C						
Any food or beverage	120	28.33 (0.04)	121	23.14 (0.04)	4.82	1.29
Food from at least 2 main food groups[2] and > 10% RDA for food energy	120	9.17 (0.03)	121	9.92 (0.03)	na[3]	na[3]
Food from at least 2 main food groups[2] and > 15% RDA for food energy	120	3.33 (0.02)	121	7.44 (0.02)	na[3]	na[3]
D						
Any food or beverage	518	13.71 (0.02)	502	5.38 (0.01)	8.84**	2.92
Food from at least 2 main food groups[2] and > 10% RDA for food energy	518	5.79 (0.01)	502	1.39 (0.01)	4.62**	4.53
Food from at least 2 main food groups[2] and > 15% RDA for food energy	518	3.09 (0.01)	502	1.00 (0.00)	2.25*	3.33
E						
Any food or beverage	842	24.82 (0.01)	821	12.55 (0.01)	12.50**	2.32
Food from at least 2 main food groups[2] and > 10% RDA for food energy	842	7.36 (0.01)	821	4.26 (0.01)	3.11**	1.79
Food from at least 2 main food groups[2] and > 15% RDA for food energy	842	3.56 (0.01)	821	1.71 (0.00)	1.88*	2.14
F						
Any food or beverage	149	25.50 (0.04)	118	11.02 (0.03)	15.10**	2.85
Food from at least 2 main food groups[2] and > 10% RDA for food energy	149	9.40 (0.02)	118	3.39 (0.02)	6.34*	3.07
Food from at least 2 main food groups[2] and > 15% RDA for food energy	149	6.04 (0.02)	118	2.54 (0.01)	3.78	2.59

na = not applicable

RDA = Recommended Dietary Allowance

[1] All three definitions of breakfast include all food and beverages, excluding water, reported consumed between 5:00 a.m. and 45 minutes after the start of school and foods consumed up to 10:30 a.m. that the student/parent reported as being part of breakfast.

[2] The five main food groups are: milk and milk products, meat and meat alternates, grain products, fruit and fruit juices, and vegetables and vegetable juices.

[3] An impact and odds ratio could not be computed because there was variation in school meal eligibility status within or across treatment groups.

Notes: Percentages include only those students for whom one source of breakfast food was the school breakfast. Almost all of these students consumed additional breakfast foods at home versus some other source.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-5

Percent of Students Usually Eating Breakfast During Typical School Week[1]

	Unadjusted Percentages (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	%		N	%		Impact	Odds Ratio
All	1710	90.00	(0.73)	1657	85.76	(0.86)	4.45**	1.53
A	153	85.62	(2.85)	127	81.10	(3.49)	4.25	1.36
B	255	90.20	(1.87)	262	80.92	(2.43)	9.14**	2.14
C	96	85.42	(3.62)	97	85.57	(3.59)	-0.42	0.97
D	437	93.36	(1.19)	418	90.19	(1.46)	3.38	1.58
E	645	90.85	(1.14)	658	87.08	(1.31)	3.60*	1.44
F	124	82.26	(3.44)	95	76.84	(4.35)	5.61	1.42

[1] Based on parent report that student ate breakfast all five school days the previous week.

* Difference is statistically significant at the .05 level.
** Difference is statistically significant at the .01 level.

Source: Impact Study -- Parent Survey, Spring 2001

Dietary Intake

Exhibit D-6

Mean Food Energy and Nutrient Intake at Breakfast, District A

	Unadjusted Means (Standard Errors)				Results of Impact Models	
Dietary Component	**Treatment Schools**		**Control Schools**		**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	19.59	(0.94)	20.32	(1.05)	-0.68	-0.05
Protein (as percent of 1989 RDA)	39.24	(2.46)	44.45	(2.96)	-5.30	-0.15
Percent of Food Energy from:						
Total fat	28.94	(1.00)	25.87	(1.25)	2.51	0.18
Saturated fat	10.15	(0.45)	9.66	(0.55)	0.13	0.02
Carbohydrate	61.02	(1.22)	63.46	(1.54)	-1.70	-0.10
Protein	11.33	(0.36)	12.15	(0.44)	-0.90	-0.18
Vitamins (as percent of RDA)[1]						
Vitamin A	52.17	(4.13)	52.46	(3.55)	4.06	0.08
Vitamin C	73.63	(6.17)	99.16	(11.75)	-22.00	-0.19
Vitamin B_6	63.32	(4.79)	66.00	(5.35)	1.87	0.03
Vitamin B_{12}	87.47	(8.27)	82.01	(7.00)	11.40	0.11
Niacin	49.74	(3.34)	50.58	(3.73)	1.66	0.04
Thiamin	65.42	(3.93)	67.46	(4.35)	0.21	0.00
Riboflavin	87.58	(5.81)	95.37	(6.25)	-5.30	-0.07
Folate	42.00	(2.85)	43.76	(2.99)	0.54	0.01
Minerals (as percent of RDA)[1]						
Calcium	31.40	(2.32)	34.01	(2.42)	-2.20	-0.07
Calcium (as percent of AI)	29.74	(2.19)	32.14	(2.27)	-1.90	-0.07
Iron	52.84	(3.28)	52.91	(4.02)	1.32	0.03
Magnesium	25.15	(1.59)	27.07	(1.93)	-0.59	-0.03
Phosphorous	33.92	(2.48)	34.48	(2.61)	0.59	0.02
Zinc	42.55	(2.99)	44.43	(3.35)	-0.35	-0.01
Other Dietary Components						
Cholesterol (mg)	40.45	(5.64)	61.82	(10.61)	-24.00	-0.23
Sodium (mg)	580.54	(29.63)	600.75	(40.56)	-35.00	-0.08
Fiber (gm)	1.88	(0.13)	1.93	(0.15)	0.00	0.00
Fiber (as percent of age-plus-5 gm)	13.29	(0.93)	13.77	(1.13)	0.04	0.00
Number of Students[2]	181		153			

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-7

Mean Food Energy and Nutrient Intake at Breakfast, District B

	Unadjusted Means (Standard Errors)				Results of Impact Models	
Dietary Component	**Treatment Schools**		**Control Schools**		**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	19.78	(0.61)	20.90	(0.75)	-0.86	-0.07
Protein (as percent of 1989 RDA)	41.45	(1.49)	44.05	(1.83)	-1.40	-0.04
Percent of Food Energy from:						
Total fat	23.15	(0.57)	23.56	(0.66)	-0.50	-0.04
Saturated fat	9.42	(0.27)	9.33	(0.30)	0.08	0.02
Carbohydrate	65.39	(0.72)	65.87	(0.96)	-0.44	-0.03
Protein	13.05	(0.26)	12.67	(0.32)	0.42	0.08
Vitamins (as percent of RDA)[1]						
Vitamin A	57.16	(2.25)	64.16	(3.13)	-4.50	-0.09
Vitamin C	66.54	(4.73)	75.91	(5.89)	-7.30	-0.07
Vitamin B_6	67.13	(3.22)	80.69	(4.96)	-11.00	-0.14
Vitamin B_{12}	84.16	(4.63)	103.27	(6.48)	-17.00	-0.16
Niacin	52.06	(2.33)	61.02	(3.59)	-7.50	-0.13
Thiamin	68.84	(2.57)	79.31	(3.96)	-8.60	-0.14
Riboflavin	101.36	(3.60)	118.73	(5.43)	-14.00*	-0.16
Folate	45.20	(1.96)	50.89	(2.60)	-4.50	-0.10
Minerals (as percent of RDA)[1]						
Calcium	37.18	(1.37)	38.18	(1.65)	0.14	0.00
Calcium (as percent of AI)	35.02	(1.30)	36.22	(1.57)	0.02	0.00
Iron	65.06	(3.28)	64.14	(3.37)	0.67	0.01
Magnesium	29.44	(1.22)	30.24	(1.33)	0.39	0.02
Phosphorous	34.48	(1.53)	38.70	(1.91)	-1.90	-0.06
Zinc	49.60	(2.36)	53.69	(3.25)	-2.30	-0.04
Other Dietary Components						
Cholesterol (mg)	42.13	(4.43)	65.67	(6.90)	-23.00*	-0.21
Sodium (mg)	523.97	(19.81)	553.75	(23.13)	-30.00	-0.07
Fiber (gm)	2.37	(0.12)	2.37	(0.11)	0.00	0.00
Fiber (as percent of age-plus-5 gm)	16.21	(0.84)	16.49	(0.80)	-0.07	0.00
Number of Students[2]	402		351			

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-8

Mean Food Energy and Nutrient Intake at Breakfast, District C

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	19.38 (1.12)	19.22 (1.15)	-0.05	0.00
Protein (as percent of 1989 RDA)	39.23 (2.59)	39.57 (2.53)	-0.98	-0.03
Percent of Food Energy from:				
Total fat	23.42 (1.14)	22.99 (1.00)	0.43	0.04
Saturated fat	10.31 (0.49)	10.37 (0.48)	-0.10	-0.02
Carbohydrate	66.35 (1.35)	67.15 (1.64)	-0.62	-0.04
Protein	11.82 (0.44)	12.27 (0.42)	-0.49	-0.11
Vitamins (as percent of RDA)[1]				
Vitamin A	55.93 (4.53)	48.59 (4.34)	6.09	0.13
Vitamin C	82.14 (10.34)	74.24 (10.43)	5.83	0.05
Vitamin B_6	71.81 (6.54)	62.21 (6.50)	8.05	0.11
Vitamin B_{12}	84.69 (8.22)	85.69 (10.50)	-2.90	-0.03
Niacin	54.10 (4.68)	50.34 (4.59)	2.74	0.05
Thiamin	73.84 (5.40)	71.85 (5.34)	0.50	0.01
Riboflavin	105.32 (7.44)	97.08 (7.34)	6.02	0.07
Folate	48.98 (3.75)	45.36 (4.02)	2.69	0.06
Minerals (as percent of RDA)[1]				
Calcium	35.76 (2.57)	35.22 (2.67)	-0.09	0.00
Calcium (as percent of AI)	34.07 (2.47)	33.37 (2.54)	0.00	0.00
Iron	61.27 (5.77)	58.12 (5.78)	3.34	0.05
Magnesium	30.11 (2.19)	29.77 (2.49)	-0.61	-0.02
Phosphorous	35.58 (3.01)	34.45 (3.13)	-0.51	-0.02
Zinc	47.03 (4.49)	38.45 (4.75)	7.37	0.15
Other Dietary Components				
Cholesterol (mg)	47.38 (8.45)	34.22 (3.56)	13.30	0.19
Sodium (mg)	468.31 (35.04)	474.89 (36.21)	-5.60	-0.01
Fiber (gm)	2.62 (0.23)	2.55 (0.21)	0.04	0.02
Fiber (as percent of age-plus-5 gm)	18.50 (1.68)	18.04 (1.56)	0.08	0.00
Number of Students[2]	120	121		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-9

Mean Food Energy and Nutrient Intake at Breakfast, District D

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	20.44 (0.51)	20.29 (0.56)	0.33	0.03
Protein (as percent of 1989 RDA)	42.59 (1.23)	41.54 (1.34)	1.71	0.06
Percent of Food Energy from:				
Total fat	22.05 (0.52)	21.45 (0.50)	0.62	0.05
Saturated fat	9.05 (0.25)	8.99 (0.24)	0.04	0.01
Carbohydrate	67.39 (0.63)	68.48 (0.61)	-1.10	-0.08
Protein	12.75 (0.20)	12.38 (0.22)	0.34	0.07
Vitamins (as percent of RDA)[1]				
Vitamin A	61.44 (2.26)	61.22 (2.36)	1.12	0.02
Vitamin C	97.91 (5.32)	87.69 (5.19)	11.30	0.10
Vitamin B_6	72.79 (2.99)	81.77 (3.47)	-7.90	-0.11
Vitamin B_{12}	101.68 (4.53)	102.05 (5.08)	0.86	0.01
Niacin	55.96 (2.14)	61.91 (2.50)	-5.20	-0.10
Thiamin	75.56 (2.38)	80.18 (2.79)	-3.50	-0.06
Riboflavin	107.21 (3.37)	111.08 (3.86)	-2.50	-0.03
Folate	53.33 (1.88)	56.04 (2.08)	-2.00	-0.04
Minerals (as percent of RDA)[1]				
Calcium	39.42 (1.25)	36.78 (1.25)	3.07	0.11
Calcium (as percent of AI)	37.25 (1.19)	34.86 (1.20)	2.84	0.11
Iron	68.77 (2.94)	74.72 (3.22)	-5.70	-0.08
Magnesium	34.08 (1.04)	35.38 (1.24)	-0.78	-0.03
Phosphorous	37.26 (1.31)	37.47 (1.49)	0.63	0.02
Zinc	51.26 (2.30)	56.72 (2.53)	-4.70	-0.09
Other Dietary Components				
Cholesterol (mg)	41.88 (4.28)	39.14 (3.65)	3.62	0.04
Sodium (mg)	539.69 (17.06)	552.32 (23.21)	-7.30	-0.02
Fiber (gm)	2.95 (0.11)	3.16 (0.13)	-0.20	-0.07
Fiber (as percent of age-plus-5 gm)	20.30 (0.78)	21.95 (0.90)	-1.50	-0.08
Number of Students[2]	518	502		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-10

Mean Food Energy and Nutrient Intake at Breakfast, District E

	Unadjusted Means (Standard Errors)				Results of Impact Models	
Dietary Component	**Treatment Schools**		**Control Schools**		**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	21.97	(0.49)	20.96	(0.44)	0.97	0.07
Protein (as percent of 1989 RDA)	44.62	(1.10)	42.12	(1.07)	2.29	0.07
Percent of Food Energy from:						
Total fat	22.17	(0.40)	23.93	(0.47)	-1.80**	-0.14
Saturated fat	8.82	(0.17)	9.31	(0.20)	-0.50	-0.09
Carbohydrate	67.62	(0.48)	66.15	(0.56)	1.47	0.10
Protein	11.98	(0.16)	11.61	(0.17)	0.35	0.07
Vitamins (as percent of RDA)[1]						
Vitamin A	72.05	(2.14)	65.24	(1.88)	6.40	0.11
Vitamin C	96.14	(4.08)	94.24	(4.35)	0.80	0.01
Vitamin B_6	96.69	(3.06)	86.78	(2.76)	9.57	0.11
Vitamin B_{12}	107.34	(3.76)	103.45	(3.93)	3.39	0.03
Niacin	72.03	(2.25)	65.06	(2.00)	6.54*	0.11
Thiamin	90.67	(2.41)	83.02	(2.21)	7.13*	0.11
Riboflavin	126.91	(3.32)	115.03	(2.98)	11.20*	0.12
Folate	58.20	(1.59)	53.23	(1.53)	4.60*	0.10
Minerals (as percent of RDA)[1]						
Calcium	39.47	(1.02)	36.02	(0.94)	3.36*	0.12
Calcium (as percent of AI)	37.78	(0.99)	34.36	(0.90)	3.29*	0.12
Iron	64.86	(1.84)	62.72	(1.97)	2.43	0.04
Magnesium	35.19	(1.04)	32.11	(0.92)	2.70	0.10
Phosphorous	42.68	(1.32)	38.39	(1.20)	3.63*	0.10
Zinc	59.09	(1.98)	53.84	(2.02)	4.88	0.08
Other Dietary Components						
Cholesterol (mg)	40.47	(2.71)	51.01	(4.21)	-11.00*	-0.11
Sodium (mg)	534.30	(13.47)	535.99	(15.90)	-1.80	0.00
Fiber (gm)	2.48	(0.08)	2.33	(0.08)	0.14	0.06
Fiber (as percent of age-plus-5 gm)	17.95	(0.58)	16.74	(0.56)	1.13	0.07
Number of Students[2]	842		821			

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.
** Difference is statistically significant at the .01 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-11

Mean Food Energy and Nutrient Intake at Breakfast, District F

	Unadjusted Means (Standard Errors)				Results of Impact Models	
Dietary Component	**Treatment Schools**		**Control Schools**		**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	22.92	(0.97)	19.86	(1.08)	2.98	0.25
Protein (as percent of 1989 RDA)	43.99	(2.34)	35.93	(2.54)	8.03	0.29
Percent of Food Energy from:						
Total fat	30.78	(1.05)	30.34	(1.59)	-0.22	-0.02
Saturated fat	12.38	(0.45)	11.29	(0.61)	0.73	0.12
Carbohydrate	58.11	(1.28)	60.22	(1.88)	-1.80	-0.10
Protein	12.23	(0.45)	10.92	(0.41)	1.70	0.34
Vitamins (as percent of RDA)[1]						
Vitamin A	38.81	(3.18)	34.82	(3.33)	5.77	0.15
Vitamin C	50.21	(6.88)	50.66	(7.69)	-0.55	-0.01
Vitamin B_6	43.00	(3.85)	46.61	(4.48)	-2.60	-0.05
Vitamin B_{12}	62.03	(5.07)	59.49	(6.76)	2.46	0.04
Niacin	38.30	(2.71)	39.47	(3.01)	-1.30	-0.04
Thiamin	58.13	(3.15)	55.08	(3.64)	2.26	0.06
Riboflavin	78.45	(4.19)	70.20	(5.43)	8.53	0.16
Folate	29.55	(2.25)	30.39	(2.63)	-0.80	-0.03
Minerals (as percent of RDA)[1]						
Calcium	32.73	(1.92)	24.99	(2.18)	8.74	0.37
Calcium (as percent of AI)	30.92	(1.82)	23.38	(2.05)	8.41	0.38
Iron	43.18	(3.03)	39.55	(3.19)	5.01	0.14
Magnesium	25.82	(1.58)	20.50	(1.66)	5.40	0.29
Phosphorous	39.42	(2.60)	26.01	(2.19)	12.50*	0.44
Zinc	33.77	(3.01)	31.52	(3.12)	1.63	0.05
Other Dietary Components						
Cholesterol (mg)	29.93	(2.67)	50.27	(10.29)	-20.00	-0.25
Sodium (mg)	679.38	(40.51)	647.03	(46.36)	51.70	0.10
Fiber (gm)	2.29	(0.19)	1.78	(0.14)	0.59	0.29
Fiber (as percent of age-plus-5 gm)	15.63	(1.21)	12.14	(1.01)	3.79	0.29
Number of Students[2]	149		118			

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-12

Mean Food Group Intake at Breakfast, District A

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
	Number of Servings[1]			
Grain Products	**1.8 (0.10)**	**1.6 (0.10)**	**0.2**	**0.16**
Whole grains	0.2 (0.04)	0.3 (0.04)	0.0	-0.05
Non-whole grains	1.6 (0.11)	1.3 (0.09)	0.2	0.19
Vegetables	**0.0 (0.01)**	**0.0 (0.01)**	**0.0**	**-0.03**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.11
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	0.0	0.10
White potatoes	0.0 (0.01)	0.0 (0.00)	0.0	0.09
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Tomatoes	0.0 (0.00)	0.0 (0.01)	0.0	-0.12
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Other vegetables	0.0 (0.00)	0.0 (0.01)	0.0	-0.04
Fruits	**0.4 (0.04)**	**0.5 (0.06)**	**-0.1**	**-0.10**
Citrus fruits, melons, and berries	0.3 (0.03)	0.4 (0.06)	-0.1	-0.13
Other fruits	0.1 (0.02)	0.1 (0.03)	0.0	0.04
Dairy Products	**0.7 (0.05)**	**0.7 (0.06)**	**-0.1**	**-0.11**
Milk	0.6 (0.05)	0.7 (0.06)	-0.1	-0.11
Yogurt	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Cheese	0.0 (0.01)	0.0 (0.01)	0.0	-0.01
Meat and Meat Substitutes	**0.1 (0.02)**	**0.2 (0.03)**	**-0.1**	**-0.22**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.01)	0.0	-0.19
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.1 (0.01)	0.1 (0.01)	0.0	0.09
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.01)	0.0	-0.25
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Eggs	0.0 (0.01)	0.1 (0.02)	0.0	-0.22
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	-0.20
Discretionary fat (gm)	9.0 (0.60)	9.6 (0.78)	-0.7	-0.08
Added sugars (tsp)	4.7 (0.38)	4.9 (0.42)	-0.1	-0.01
Number of Students[3]	181	153		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-13

Mean Food Group Intake at Breakfast, District B

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
	Number of Servings[1]			
Grain Products	**1.6 (0.07)**	**1.6 (0.06)**	**0.0**	**-0.01**
Whole grains	0.4 (0.04)	0.4 (0.04)	0.0	-0.02
Non-whole grains	1.2 (0.06)	1.2 (0.06)	0.0	0.00
Vegetables	**0.0 (0.01)**	**0.0 (0.01)**	**0.0**	**-0.10**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	0.0	0.06
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.05
White potatoes	0.0 (0.00)	0.0 (0.01)	0.0	-0.11
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Tomatoes	0.0 (0.00)	0.0 (0.00)	0.0	0.01
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	0.0	-0.03
Other vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.05
Fruits	**0.6 (0.04)**	**0.5 (0.04)**	**0.2***	**0.20**
Citrus fruits, melons, and berries	0.2 (0.03)	0.2 (0.03)	0.0	0.01
Other fruits	0.4 (0.03)	0.2 (0.03)	0.2*	0.27
Dairy Products	**0.8 (0.04)**	**0.9 (0.04)**	**0.0**	**-0.02**
Milk	0.8 (0.03)	0.8 (0.04)	0.0	-0.01
Yogurt	0.0 (0.00)	0.0 (0.00)	0.0	0.07
Cheese	0.0 (0.00)	0.0 (0.01)	0.0	-0.10
Meat and Meat Substitutes	**0.1 (0.01)**	**0.1 (0.01)**	**0.0**	**-0.09**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.01)	0.0	-0.04
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.0 (0.00)	0.0 (0.00)	0.0	0.11
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.00)	0.0	0.04
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	0.0	0.09
Eggs	0.0 (0.01)	0.1 (0.01)	0.0*	-0.21
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.11
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	0.01
Discretionary fat (gm)	8.7 (0.39)	9.6 (0.50)	-0.9	-0.10
Added sugars (tsp)	4.7 (0.23)	5.9 (0.33)	-1.2*	-0.22
Number of Students[3]	402	351		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-14

Mean Food Group Intake at Breakfast, District C

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
	Number of Servings[1]			
Grain Products	**1.6 (0.12)**	**1.9 (0.15)**	**-0.3**	**-0.19**
Whole grains	0.3 (0.06)	0.5 (0.10)	-0.2	-0.16
Non-whole grains	1.3 (0.12)	1.5 (0.13)	-0.1	-0.10
Vegetables	**0.0 (0.04)**	**0.0 (0.01)**	**0.0**	**0.12**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.14
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
White potatoes	0.0 (0.04)	0.0 (0.01)	0.0	0.12
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Tomatoes	0.0 (0.00)	0.0 (0.00)	0.0	0.16
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	0.0	-0.11
Other vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.08
Fruits	**0.5 (0.07)**	**0.5 (0.06)**	**0.1**	**0.11**
Citrus fruits, melons, and berries	0.3 (0.05)	0.2 (0.04)	0.1	0.12
Other fruits	0.3 (0.05)	0.2 (0.04)	0.0	0.04
Dairy Products	**0.8 (0.06)**	**0.8 (0.06)**	**0.0**	**-0.01**
Milk	0.8 (0.06)	0.8 (0.06)	0.0	-0.01
Yogurt	0.0 (0.01)	0.0 (0.01)	0.0	-0.10
Cheese	0.0 (0.01)	0.0 (0.00)	0.0	0.15
Meat and Meat Substitutes	**0.1 (0.02)**	**0.0 (0.01)**	**0.0**	**0.26**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.00)	0.0	-0.17
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.0 (0.01)	0.0 (0.00)	0.0	0.19
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	0.0	-0.12
Eggs	0.0 (0.01)	0.0 (0.00)	0.0	0.23
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.14
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	0.11
Discretionary fat (gm)	9.2 (0.79)	8.5 (0.73)	0.7	0.08
Added sugars (tsp)	4.1 (0.34)	3.8 (0.36)	0.3	0.08
Number of Students[3]	120	121		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-15

Mean Food Group Intake at Breakfast, District D

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
		Number of Servings[1]		
Grain Products	**1.8 (0.07)**	**1.8 (0.07)**	**0.1**	**0.04**
Whole grains	0.7 (0.04)	0.8 (0.04)	-0.1	-0.07
Non-whole grains	1.2 (0.06)	1.0 (0.06)	0.1	0.09
Vegetables	**0.0 (0.00)**	**0.1 (0.02)**	**0.0**	**-0.11**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	0.0	0.00
White potatoes	0.0 (0.00)	0.0 (0.02)	0.0	-0.11
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	0.0	0.05
Tomatoes	0.0 (0.00)	0.0 (0.00)	0.0	0.08
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Other vegetables	0.0 (0.00)	0.0 (0.01)	0.0	-0.06
Fruits	**0.5 (0.04)**	**0.5 (0.03)**	**0.1**	**0.07**
Citrus fruits, melons, and berries	0.4 (0.03)	0.3 (0.03)	0.1	0.12
Other fruits	0.2 (0.02)	0.2 (0.02)	0.0	-0.04
Dairy Products	**0.9 (0.03)**	**0.8 (0.03)**	**0.1**	**0.08**
Milk	0.8 (0.03)	0.8 (0.03)	0.0	0.04
Yogurt	0.0 (0.01)	0.0 (0.00)	0.0	0.31
Cheese	0.0 (0.01)	0.0 (0.01)	0.0	0.00
Meat and Meat Substitutes	**0.1 (0.01)**	**0.1 (0.01)**	**0.0**	**-0.02**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.00)	0.0	-0.07
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.0 (0.00)	0.0 (0.00)	0.0	-0.01
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.01)	0.0	-0.06
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Eggs	0.0 (0.01)	0.0 (0.01)	0.0	0.04
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.01
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	0.03
Discretionary fat (gm)	8.7 (0.36)	8.4 (0.38)	0.3	0.04
Added sugars (tsp)	5.2 (0.21)	5.4 (0.25)	-0.1	-0.03
Number of Students[3]	518	502		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-16

Mean Food Group Intake at Breakfast, District E

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
		Number of Servings[1]		
Grain Products	**1.8 (0.05)**	**1.7 (0.05)**	**0.1**	**0.06**
Whole grains	0.5 (0.02)	0.4 (0.02)	0.1	0.15
Non-whole grains	1.2 (0.04)	1.3 (0.04)	0.0	-0.02
Vegetables	**0.0 (0.01)**	**0.0 (0.01)**	**0.0**	**0.03**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.06
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	0.0	0.00
White potatoes	0.0 (0.01)	0.0 (0.00)	0.0	0.02
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	0.0	-0.06
Tomatoes	0.0 (0.00)	0.0 (0.00)	0.0	0.05
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	0.0	0.07
Other vegetables	0.0 (0.00)	0.0 (0.00)	0.0	0.04
Fruits	**0.6 (0.02)**	**0.5 (0.03)**	**0.0**	**0.06**
Citrus fruits, melons, and berries	0.3 (0.02)	0.3 (0.02)	0.0	-0.02
Other fruits	0.3 (0.02)	0.3 (0.02)	0.1	0.12
Dairy Products	**0.8 (0.02)**	**0.7 (0.02)**	**0.1***	**0.14**
Milk	0.8 (0.02)	0.7 (0.02)	0.1*	0.10
Yogurt	0.0 (0.00)	0.0 (0.00)	0.0	0.10
Cheese	0.0 (0.01)	0.0 (0.00)	0.0	0.12
Meat and Meat Substitutes	**0.1 (0.01)**	**0.1 (0.01)**	**0.0***	**-0.11**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.00)	0.0	-0.05
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.0 (0.00)	0.0 (0.00)	0.0	-0.05
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.00)	0.0	-0.01
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	0.0	0.00
Eggs	0.0 (0.00)	0.1 (0.01)	0.0*	-0.13
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.02
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	0.00
Discretionary fat (gm)	9.7 (0.35)	9.7 (0.34)	0.0	0.00
Added sugars (tsp)	5.6 (0.19)	5.2 (0.17)	0.3	0.06
Number of Students[3]	842	821		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-17

Mean Food Group Intake at Breakfast, District F

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
		Number of Servings[1]		
Grain Products	**2.2 (0.11)**	**1.6 (0.14)**	**0.6**	**0.39**
Whole grains	0.1 (0.04)	0.2 (0.05)	-0.1	-0.17
Non-whole grains	2.0 (0.11)	1.4 (0.13)	0.6	0.45
Vegetables	**0.1 (0.01)**	**0.1 (0.03)**	**0.0**	**-0.19**
Dark green vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Deep yellow vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
White potatoes	0.0 (0.01)	0.1 (0.02)	-0.1	-0.39
Other starchy vegetables	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Tomatoes	0.0 (0.01)	0.0 (0.01)	0.0	0.48
Cooked dry beans and peas	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Other vegetables	0.0 (0.00)	0.0 (0.02)	0.0	-0.10
Fruits	**0.5 (0.05)**	**0.4 (0.05)**	**0.1**	**0.15**
Citrus fruits, melons, and berries	0.2 (0.04)	0.2 (0.04)	0.0	0.03
Other fruits	0.3 (0.03)	0.2 (0.03)	0.1	0.18
Dairy Products	**0.7 (0.05)**	**0.5 (0.06)**	**0.2**	**0.37**
Milk	0.7 (0.05)	0.5 (0.06)	0.2	0.31
Yogurt	0.0 (0.00)	0.0 (0.00)	0.0	-0.15
Cheese	0.1 (0.01)	0.0 (0.01)	0.1	0.34
Meat and Meat Substitutes	**0.2 (0.03)**	**0.2 (0.03)**	**0.0**	**-0.08**
Red meat (beef, pork, veal, lamb, game)	0.0 (0.00)	0.0 (0.01)	0.0	-0.21
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.1 (0.03)	0.1 (0.02)	0.0	0.10
Poultry (chicken, turkey, other)	0.0 (0.00)	0.0 (0.00)	0.0	-0.15
Fish and shellfish	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Eggs	0.0 (0.00)	0.0 (0.02)	0.0	-0.31
Soybean products (tofu, meat analogues)	0.0 (0.01)	0.0 (0.00)	0.0	0.11
Nuts and seeds	0.0 (0.00)	0.0 (0.00)	0.0	-0.16
Discretionary fat (gm)	11.8 (0.71)	11.0 (0.97)	0.8	0.08
Added sugars (tsp)	6.0 (0.36)	5.3 (0.52)	0.6	0.13
Number of Students[3]	149	118		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-18

Mean Food Energy and Nutrient Intake Over 24 Hours, District A

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	99.52 (2.06)	104.79 (2.58)	-4.50	-0.17
Protein (as percent of 1989 RDA)	254.00 (7.87)	263.01 (9.20)	-5.90	-0.06
Percent of Food Energy from:				
Total fat	33.12 (0.48)	31.94 (0.54)	0.84	0.14
Saturated fat	11.92 (0.23)	11.73 (0.29)	0.09	0.03
Carbohydrate	53.12 (0.58)	54.81 (0.65)	-1.30	-0.17
Protein	14.84 (0.31)	14.47 (0.29)	0.35	0.10
Vitamins (as percent of RDA)[1]				
Vitamin A	136.72 (7.07)	152.27 (9.20)	-12.00	-0.13
Vitamin C	213.89 (13.76)	276.87 (21.30)	-62.00	-0.30
Vitamin B_6	204.72 (9.53)	211.59 (10.16)	-0.29	0.00
Vitamin B_{12}	285.86 (13.53)	274.10 (15.34)	16.60	0.10
Niacin	205.13 (7.96)	211.16 (8.58)	0.31	0.00
Thiamin	219.53 (8.46)	241.04 (8.99)	-17.00	-0.16
Riboflavin	273.79 (10.81)	299.37 (11.62)	-22.00	-0.16
Folate	137.60 (5.68)	143.37 (5.19)	-2.50	-0.04
Minerals (as percent of RDA)[1]				
Calcium	114.44 (4.69)	136.40 (6.07)	-20.00*	-0.32
Calcium (as percent of AI)	108.61 (4.58)	128.62 (5.70)	-18.00	-0.30
Iron	171.95 (5.26)	175.51 (6.61)	-1.10	-0.02
Magnesium	120.92 (5.09)	125.48 (4.93)	-3.00	-0.05
Phosphorous	149.80 (8.24)	152.32 (7.81)	0.24	0.00
Zinc	170.48 (7.17)	162.99 (6.68)	9.77	0.12
Other Dietary Components				
Cholesterol (mg)	230.09 (11.31)	219.77 (14.51)	9.72	0.06
Sodium (mg)	3210.44 (86.64)	3346.00 (105.20)	-145.00	-0.13
Fiber (gm)	12.40 (0.42)	13.52 (0.42)	-1.10	-0.22
Fiber (as percent of age-plus-5 gm)	88.23 (3.23)	95.47 (3.07)	-6.80	-0.18
Number of Students[2]	155	125		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-19

Mean Food Energy and Nutrient Intake Over 24 Hours, District B

Dietary Component	Unadjusted Means (Standard Errors)		Results of Impact Models	
	Treatment Schools	Control Schools	Impact	Effect Size
Food Energy (as percent of 1989 RDA)	97.06 (1.75)	103.67 (2.04)	-5.90	-0.19
Protein (as percent of 1989 RDA)	232.16 (5.55)	246.53 (6.26)	-9.30	-0.10
Percent of Food Energy from:				
Total fat	31.59 (0.42)	32.86 (0.41)	-1.20	-0.18
Saturated fat	11.71 (0.20)	11.96 (0.19)	-0.18	-0.06
Carbohydrate	55.09 (0.53)	54.02 (0.49)	1.00	0.12
Protein	14.58 (0.23)	14.44 (0.21)	0.15	0.04
Vitamins (as percent of RDA)[1]				
Vitamin A	148.56 (5.36)	169.13 (5.94)	-18.00*	-0.20
Vitamin C	220.61 (11.57)	246.77 (12.19)	-18.00	-0.09
Vitamin B_6	194.95 (6.40)	219.88 (6.84)	-20.00*	-0.18
Vitamin B_{12}	256.42 (9.17)	316.73 (14.10)	-56.00**	-0.29
Niacin	191.35 (5.09)	209.46 (5.63)	-15.00	-0.18
Thiamin	222.40 (5.91)	242.23 (6.32)	-16.00	-0.16
Riboflavin	291.28 (7.94)	321.08 (8.42)	-24.00*	-0.18
Folate	132.98 (4.05)	146.44 (4.19)	-11.00	-0.17
Minerals (as percent of RDA)[1]				
Calcium	132.91 (4.22)	136.11 (3.92)	-0.58	-0.01
Calcium (as percent of AI)	125.70 (4.04)	129.15 (3.76)	-0.62	-0.01
Iron	177.37 (5.51)	184.96 (5.62)	-8.40	-0.09
Magnesium	122.41 (3.52)	133.50 (3.56)	-7.80	-0.14
Phosphorous	148.17 (5.64)	161.45 (5.66)	-7.00	-0.08
Zinc	156.25 (4.97)	173.39 (4.99)	-13.00	-0.16
Other Dietary Components				
Cholesterol (mg)	198.54 (8.76)	233.05 (11.18)	-34.00*	-0.21
Sodium (mg)	3187.84 (72.66)	3421.77 (81.92)	-247.00	-0.20
Fiber (gm)	12.85 (0.36)	13.82 (0.36)	-0.92	-0.16
Fiber (as percent of age-plus-5 gm)	88.94 (2.61)	96.28 (2.50)	-6.00	-0.15
Number of Students[2]	257	263		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-20

Mean Food Energy and Nutrient Intake Over 24 Hours, District C

	Unadjusted Means (Standard Errors)				Results of Impact Models	
Dietary Component	**Treatment Schools**		**Control Schools**		**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	101.30	(3.28)	107.46	(3.09)	-6.70	-0.21
Protein (as percent of 1989 RDA)	247.32	(9.99)	260.62	(9.41)	-16.00	-0.17
Percent of Food Energy from:						
Total fat	30.29	(0.65)	31.44	(0.57)	-1.30	-0.21
Saturated fat	11.60	(0.31)	12.02	(0.30)	-0.45	-0.15
Carbohydrate	56.72	(0.78)	55.62	(0.67)	1.16	0.16
Protein	14.42	(0.33)	14.47	(0.34)	0.00	0.00
Vitamins (as percent of RDA)[1]						
Vitamin A	173.09	(10.51)	185.57	(11.60)	-17.00	-0.15
Vitamin C	359.98	(30.45)	316.42	(25.95)	37.00	0.13
Vitamin B_6	255.75	(16.10)	231.73	(11.83)	19.00	0.14
Vitamin B_{12}	338.37	(24.73)	303.15	(17.74)	30.00	0.14
Niacin	224.66	(12.88)	210.21	(10.15)	11.90	0.10
Thiamin	264.89	(13.41)	258.98	(10.34)	1.29	0.01
Riboflavin	335.99	(16.62)	332.26	(14.60)	-3.30	-0.02
Folate	170.33	(11.48)	183.21	(8.73)	-15.00	-0.15
Minerals (as percent of RDA)[1]						
Calcium	139.80	(6.89)	152.21	(7.19)	-15.00	-0.22
Calcium (as percent of AI)	133.18	(6.62)	144.49	(6.88)	-14.00	-0.21
Iron	195.01	(9.96)	208.70	(10.55)	-12.00	-0.12
Magnesium	146.53	(7.68)	156.06	(7.46)	-13.00	-0.18
Phosphorous	168.81	(10.46)	176.06	(10.76)	-13.00	-0.13
Zinc	186.06	(10.47)	174.29	(9.14)	9.28	0.10
Other Dietary Components						
Cholesterol (mg)	222.35	(15.53)	243.62	(19.99)	-25.00	-0.14
Sodium (mg)	3067.28	(117.90)	3218.53	(125.40)	-160.00	-0.13
Fiber (gm)	15.89	(0.81)	18.39	(1.00)	-2.50	-0.28
Fiber (as percent of age-plus-5 gm)	112.87	(5.87)	129.37	(7.03)	-17.00	-0.27
Number of Students[2]	96		96			

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-21

Mean Food Energy and Nutrient Intake Over 24 Hours, District D

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	103.04 (1.41)	101.63 (1.51)	2.42	0.08
Protein (as percent of 1989 RDA)	246.13 (4.36)	238.72 (4.30)	10.70	0.12
Percent of Food Energy from:				
Total fat	31.45 (0.32)	31.89 (0.32)	-0.46	-0.07
Saturated fat	12.01 (0.16)	12.20 (0.17)	-0.20	-0.06
Carbohydrate	55.44 (0.37)	55.14 (0.39)	0.28	0.04
Protein	14.65 (0.16)	14.43 (0.18)	0.23	0.07
Vitamins (as percent of RDA)[1]				
Vitamin A	179.02 (4.64)	174.62 (4.58)	6.61	0.07
Vitamin C	256.13 (10.47)	259.32 (10.44)	-3.60	-0.02
Vitamin B_6	215.29 (5.75)	218.41 (5.80)	-0.67	-0.01
Vitamin B_{12}	318.41 (8.62)	342.54 (19.42)	-17.00	-0.06
Niacin	205.90 (4.77)	209.63 (4.91)	-1.40	-0.01
Thiamin	243.96 (4.77)	247.84 (4.91)	-1.40	-0.01
Riboflavin	328.74 (6.38)	324.88 (6.77)	8.22	0.06
Folate	155.60 (3.42)	156.31 (3.68)	0.85	0.01
Minerals (as percent of RDA)[1]				
Calcium	145.17 (2.95)	138.30 (2.91)	9.16*	0.15
Calcium (as percent of AI)	137.06 (2.82)	130.91 (2.79)	8.36*	0.15
Iron	193.82 (4.60)	192.84 (5.25)	3.46	0.03
Magnesium	139.65 (3.06)	138.23 (3.01)	3.30	0.05
Phosphorous	161.71 (4.52)	161.03 (4.49)	2.86	0.03
Zinc	175.82 (4.27)	176.96 (4.60)	1.33	0.01
Other Dietary Components				
Cholesterol (mg)	215.37 (7.19)	208.29 (7.13)	10.40	0.07
Sodium (mg)	3347.59 (62.44)	3267.36 (65.99)	118.00	0.09
Fiber (gm)	15.26 (0.30)	15.04 (0.32)	0.41	0.06
Fiber (as percent of age-plus-5 gm)	105.57 (2.09)	104.17 (2.22)	2.61	0.06
Number of Students[2]	427	412		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-22

Mean Food Energy and Nutrient Intake Over 24 Hours, District E

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
Food Energy (as percent of 1989 RDA)	98.82 (1.16)	99.76 (1.11)	-0.92	-0.03
Protein (as percent of 1989 RDA)	239.25 (3.47)	249.71 (3.80)	-11.00	-0.12
Percent of Food Energy from:				
Total fat	31.32 (0.26)	31.59 (0.24)	-0.25	-0.04
Saturated fat	11.36 (0.13)	11.75 (0.12)	-0.40*	-0.13
Carbohydrate	55.99 (0.30)	55.50 (0.29)	0.51	0.07
Protein	14.25 (0.14)	14.50 (0.14)	-0.26	-0.07
Vitamins (as percent of RDA)[1]				
Vitamin A	173.09 (3.98)	162.90 (3.92)	9.66	0.10
Vitamin C	270.97 (8.91)	262.38 (8.38)	4.15	0.02
Vitamin B_6	235.21 (5.14)	228.81 (4.50)	5.72	0.05
Vitamin B_{12}	302.53 (6.67)	307.58 (7.53)	-5.10	-0.03
Niacin	220.43 (4.06)	214.50 (3.61)	5.16	0.05
Thiamin	257.58 (4.28)	246.36 (4.12)	11.20	0.10
Riboflavin	315.71 (5.28)	307.22 (5.26)	7.67	0.06
Folate	158.48 (3.03)	146.65 (2.73)	11.40*	0.15
Minerals (as percent of RDA)[1]				
Calcium	132.27 (2.35)	134.92 (2.67)	-2.10	-0.03
Calcium (as percent of AI)	126.61 (2.29)	128.63 (2.56)	-1.60	-0.03
Iron	176.79 (3.01)	174.71 (3.28)	3.37	0.04
Magnesium	139.85 (2.71)	137.49 (2.45)	0.99	0.02
Phosphorous	169.29 (3.91)	166.14 (3.85)	1.10	0.01
Zinc	175.92 (3.47)	176.30 (3.42)	-0.95	-0.01
Other Dietary Components				
Cholesterol (mg)	185.88 (4.97)	204.07 (6.28)	-18.00*	-0.13
Sodium (mg)	3167.97 (45.59)	3181.58 (47.58)	-0.09	0.00
Fiber (gm)	13.89 (0.25)	13.51 (0.22)	0.41	0.07
Fiber (as percent of age-plus-5 gm)	100.39 (1.79)	97.13 (1.60)	3.05	0.07
Number of Students[2]	645	662		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-23

Mean Food Energy and Nutrient Intake Over 24 Hours, District F

Dietary Component	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools		Impact	Effect Size
Food Energy (as percent of 1989 RDA)	105.13	(2.89)	104.46	(3.42)	0.79	0.02
Protein (as percent of 1989 RDA)	236.95	(9.50)	243.57	(11.79)	-12.00	-0.11
Percent of Food Energy from:						
Total fat	33.40	(0.54)	34.23	(0.87)	-0.96	-0.14
Saturated fat	12.66	(0.26)	12.40	(0.38)	0.11	0.03
Carbohydrate	53.91	(0.68)	52.58	(0.98)	1.45	0.18
Protein	13.91	(0.36)	14.21	(0.35)	-0.27	-0.08
Vitamins (as percent of RDA)[1]						
Vitamin A	135.78	(7.74)	107.03	(6.58)	27.60	0.36
Vitamin C	199.59	(13.91)	190.77	(15.94)	6.03	0.04
Vitamin B_6	179.38	(7.89)	187.05	(11.36)	-11.00	-0.12
Vitamin B_{12}	258.19	(14.04)	245.15	(17.63)	9.41	0.06
Niacin	180.62	(6.67)	190.77	(8.95)	-13.00	-0.17
Thiamin	223.93	(8.63)	219.72	(11.52)	0.38	0.00
Riboflavin	277.28	(10.72)	249.78	(11.35)	23.60	0.21
Folate	121.71	(4.70)	121.83	(5.76)	-2.40	-0.05
Minerals (as percent of RDA)[1]						
Calcium	129.54	(6.25)	108.79	(5.57)	19.80	0.32
Calcium (as percent of AI)	122.42	(5.87)	102.52	(5.39)	18.60	0.32
Iron	160.60	(5.54)	164.87	(6.77)	-4.20	-0.07
Magnesium	123.98	(4.88)	112.63	(5.86)	8.56	0.16
Zinc	148.84	(7.97)	155.21	(9.98)	-9.40	-0.12
Phosphorous	157.14	(5.85)	139.90	(9.51)	11.70	0.13
Other Dietary Components						
Cholesterol (mg)	200.72	(12.90)	223.75	(15.57)	-24.00	-0.17
Sodium (mg)	3499.11	(109.90)	3678.97	(138.40)	-220.00	-0.18
Fiber (gm)	13.93	(0.49)	13.85	(0.84)	0.05	0.01
Fiber (as percent of age-plus-5 gm)	96.20	(3.41)	95.43	(5.82)	-0.40	-0.01
Number of Students[2]	119		90			

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented as a percent of both the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-24

Mean Food Group Intake Over 24 Hours, District A

Food Group	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools		Impact	Effect Size
	Number of Servings[1]					
Grain Products	**7.2**	**(0.25)**	**7.7**	**(0.29)**	**-0.5**	**-0.17**
Whole grains	0.8	(0.10)	0.6	(0.07)	0.2	0.15
Non-whole grains	6.4	(0.24)	7.1	(0.29)	-0.7	-0.22
Vegetables	**2.1**	**(0.14)**	**2.6**	**(0.16)**	**-0.5**	**-0.28**
Dark green vegetables	0.0	(0.01)	0.1	(0.03)	-0.1	-0.20
Deep yellow vegetables	0.1	(0.02)	0.1	(0.04)	-0.1	-0.18
White potatoes	0.9	(0.11)	1.1	(0.12)	-0.2	-0.12
Other starchy vegetables	0.2	(0.04)	0.3	(0.04)	-0.1	-0.10
Tomatoes	0.3	(0.03)	0.4	(0.04)	-0.1	-0.15
Cooked dry beans and peas	0.1	(0.03)	0.1	(0.02)	0.0	0.12
Other vegetables	0.5	(0.05)	0.6	(0.07)	-0.1	-0.14
Fruits	**1.4**	**(0.10)**	**1.5**	**(0.13)**	**-0.1**	**-0.06**
Citrus fruits, melons, and berries	0.6	(0.06)	0.8	(0.09)	-0.2	-0.25
Other fruits	0.8	(0.07)	0.7	(0.09)	0.1	0.13
Dairy Products	**2.1**	**(0.10)**	**2.5**	**(0.13)**	**-0.4**	**-0.26**
Milk	1.6	(0.09)	1.9	(0.11)	-0.2	-0.17
Yogurt	0.0	(0.01)	0.0	(0.01)	0.0	0.02
Cheese	0.4	(0.04)	0.6	(0.05)	-0.2	-0.28
Meat and Meat Substitutes	**1.8**	**(0.08)**	**1.5**	**(0.09)**	**0.3**	**0.30**
Red meat (beef, pork, veal, lamb, game)	0.9	(0.07)	0.6	(0.07)	0.3	0.33
Organ meats	0.0	(0.00)	0.0	(0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.2	(0.03)	0.2	(0.03)	0.0	0.07
Poultry (chicken, turkey, other)	0.5	(0.06)	0.5	(0.06)	0.0	0.05
Fish and shellfish	0.0	(0.01)	0.1	(0.02)	0.0	-0.19
Eggs	0.1	(0.02)	0.1	(0.02)	0.0	0.01
Soybean products (tofu, meat analogues)	0.0	(0.00)	0.0	(0.00)	0.0	0.20
Nuts and seeds	0.1	(0.01)	0.1	(0.01)	0.0	-0.14
Discretionary fat (gm)	54.4	(1.52)	60.7	(2.04)	-6.3	-0.31
Added sugars (tsp)	24.8	(0.89)	24.9	(1.06)	0.6	0.05
Number of Students[3]	155		125			

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-25

Mean Food Group Intake Over 24 Hours, District B

Food Group	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools		Impact	Effect Size
	Number of Servings[1]					
Grain Products	**7.3**	**(0.19)**	**7.7**	**(0.22)**	**-0.4**	**-0.13**
Whole grains	1.0	(0.08)	1.2	(0.09)	-0.3	-0.19
Non-whole grains	6.3	(0.18)	6.5	(0.22)	-0.2	-0.06
Vegetables	**2.0**	**(0.11)**	**2.2**	**(0.12)**	**-0.2**	**-0.12**
Dark green vegetables	0.0	(0.01)	0.1	(0.02)	-0.1*	-0.24
Deep yellow vegetables	0.1	(0.02)	0.2	(0.02)	0.0	-0.10
White potatoes	0.8	(0.08)	1.0	(0.09)	-0.2	-0.10
Other starchy vegetables	0.1	(0.02)	0.1	(0.02)	0.0	-0.01
Tomatoes	0.4	(0.03)	0.4	(0.03)	0.0	0.00
Cooked dry beans and peas	0.1	(0.02)	0.1	(0.03)	0.0	-0.02
Other vegetables	0.5	(0.05)	0.5	(0.04)	0.0	0.06
Fruits	**1.9**	**(0.11)**	**1.7**	**(0.12)**	**0.3**	**0.14**
Citrus fruits, melons, and berries	0.7	(0.07)	0.8	(0.08)	-0.1	-0.04
Other fruits	1.3	(0.08)	1.0	(0.08)	0.3	0.24
Dairy Products	**2.6**	**(0.09)**	**2.8**	**(0.09)**	**-0.2**	**-0.10**
Milk	2.0	(0.08)	2.1	(0.08)	-0.1	-0.08
Yogurt	0.1	(0.01)	0.1	(0.01)	0.0	-0.04
Cheese	0.6	(0.04)	0.6	(0.04)	0.0	-0.06
Meat and Meat Substitutes	**1.3**	**(0.06)**	**1.5**	**(0.06)**	**-0.1**	**-0.12**
Red meat (beef, pork, veal, lamb, game)	0.5	(0.04)	0.5	(0.05)	-0.1	-0.09
Organ meats	0.0	(0.00)	0.0	(0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.2	(0.02)	0.3	(0.03)	-0.1	-0.13
Poultry (chicken, turkey, other)	0.4	(0.04)	0.4	(0.04)	0.1	0.12
Fish and shellfish	0.1	(0.02)	0.1	(0.02)	0.0	-0.04
Eggs	0.1	(0.01)	0.1	(0.02)	-0.1*	-0.21
Soybean products (tofu, meat analogues)	0.0	(0.01)	0.0	(0.00)	0.0	0.15
Nuts and seeds	0.1	(0.01)	0.1	(0.01)	0.0	-0.10
Discretionary fat (gm)	58.7	(1.53)	63.5	(1.69)	-4.8	-0.19
Added sugars (tsp)	23.7	(0.80)	25.0	(0.82)	-1.3	-0.10
Number of Students[3]	257		263			

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

- Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-26

Mean Food Group Intake Over 24 Hours, District C

	Unadjusted Means (Standard Errors)		**Results of Impact Models**	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
		Number of Servings[1]		
Grain Products	**7.3 (0.29)**	**8.5 (0.33)**	**-1.1**	**-0.35**
Whole grains	0.9 (0.12)	0.9 (0.14)	-0.2	-0.11
Non-whole grains	6.5 (0.27)	7.6 (0.32)	-0.9	-0.32
Vegetables	**2.4 (0.21)**	**2.1 (0.18)**	**0.3**	**0.14**
Dark green vegetables	0.2 (0.05)	0.1 (0.04)	0.0	0.02
Deep yellow vegetables	0.2 (0.05)	0.3 (0.06)	-0.1	-0.11
White potatoes	0.8 (0.15)	0.5 (0.11)	0.3	0.23
Other starchy vegetables	0.1 (0.03)	0.1 (0.03)	0.0	0.01
Tomatoes	0.5 (0.06)	0.5 (0.07)	0.0	0.03
Cooked dry beans and peas	0.2 (0.05)	0.5 (0.09)	-0.2	-0.34
Other vegetables	0.6 (0.07)	0.6 (0.07)	0.0	0.03
Fruits	**2.5 (0.18)**	**2.3 (0.20)**	**0.3**	**0.15**
Citrus fruits, melons, and berries	1.0 (0.13)	0.9 (0.12)	0.2	0.13
Other fruits	1.4 (0.15)	1.4 (0.14)	0.1	0.08
Dairy Products	**2.6 (0.15)**	**2.9 (0.15)**	**-0.2**	**-0.16**
Milk	2.0 (0.13)	2.2 (0.12)	-0.1	-0.11
Yogurt	0.1 (0.02)	0.1 (0.03)	0.0	-0.17
Cheese	0.5 (0.06)	0.6 (0.07)	-0.1	-0.10
Meat and Meat Substitutes	**1.3 (0.10)**	**1.2 (0.09)**	**0.1**	**0.11**
Red meat (beef, pork, veal, lamb, game)	0.6 (0.08)	0.3 (0.06)	0.2	0.31
Organ meats	0.0 (0.00)	0.0 (0.01)	0.0	-0.15
Frankfurters, sausage, luncheon meats	0.2 (0.03)	0.2 (0.03)	0.0	0.03
Poultry (chicken, turkey, other)	0.3 (0.05)	0.4 (0.07)	0.0	-0.07
Fish and shellfish	0.1 (0.03)	0.1 (0.04)	0.0	-0.11
Eggs	0.1 (0.02)	0.1 (0.03)	0.0	-0.11
Soybean products (tofu, meat analogues)	0.0 (0.02)	0.0 (0.00)	0.0	0.14
Nuts and seeds	0.1 (0.02)	0.1 (0.02)	0.0	-0.04
Discretionary fat (gm)	59.2 (2.81)	64.0 (2.53)	-4.8	-0.18
Added sugars (tsp)	22.7 (1.48)	21.6 (1.23)	1.5	0.11
Number of Students[2]	96	96		

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] Includes students who skipped breakfast.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-27

Mean Food Group Intake Over 24 Hours, District D

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Food Group	**Treatment Schools**	**Control Schools**	**Impact**	**Effect Size**
		Number of Servings[1]		
Grain Products	**7.8 (0.16)**	**7.7 (0.17)**	**0.1**	**0.03**
Whole grains	1.5 (0.07)	1.4 (0.08)	0.1	0.08
Non-whole grains	6.2 (0.15)	6.3 (0.16)	0.0	0.00
Vegetables	**2.1 (0.09)**	**2.1 (0.08)**	**0.1**	**0.05**
Dark green vegetables	0.2 (0.03)	0.2 (0.02)	0.0	0.04
Deep yellow vegetables	0.1 (0.02)	0.1 (0.02)	0.0	0.00
White potatoes	0.7 (0.06)	0.9 (0.06)	-0.1	-0.08
Other starchy vegetables	0.2 (0.02)	0.1 (0.02)	0.1*	0.20
Tomatoes	0.4 (0.03)	0.4 (0.02)	0.0	0.07
Cooked dry beans and peas	0.1 (0.01)	0.1 (0.02)	0.0	-0.03
Other vegetables	0.5 (0.03)	0.5 (0.03)	0.1	0.07
Fruits	**1.7 (0.08)**	**1.8 (0.09)**	**-0.1**	**-0.08**
Citrus fruits, melons, and berries	0.8 (0.06)	0.8 (0.06)	0.0	-0.02
Other fruits	0.9 (0.06)	1.0 (0.06)	-0.1	-0.08
Dairy Products	**3.1 (0.07)**	**3.0 (0.07)**	**0.2**	**0.14**
Milk	2.4 (0.06)	2.3 (0.07)	0.1	0.08
Yogurt	0.1 (0.01)	0.1 (0.01)	0.1*	0.26
Cheese	0.6 (0.03)	0.6 (0.03)	0.0	0.05
Meat and Meat Substitutes	**1.3 (0.05)**	**1.3 (0.05)**	**0.0**	**0.01**
Red meat (beef, pork, veal, lamb, game)	0.5 (0.03)	0.6 (0.03)	0.0	-0.02
Organ meats	0.0 (0.00)	0.0 (0.00)	0.0	-0.07
Frankfurters, sausage, luncheon meats	0.2 (0.02)	0.2 (0.02)	0.0	0.01
Poultry (chicken, turkey, other)	0.3 (0.03)	0.3 (0.03)	0.0	0.05
Fish and shellfish	0.1 (0.01)	0.1 (0.02)	0.0	-0.06
Eggs	0.1 (0.01)	0.1 (0.01)	0.0	0.04
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.02
Nuts and seeds	0.1 (0.01)	0.1 (0.01)	0.0	-0.03
Discretionary fat (gm)	61.7 (1.24)	60.5 (1.32)	1.9	0.07
Added sugars (tsp)	25.0 (0.63)	24.5 (0.68)	1.0	0.07
Number of Students[2]	427	412		

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-28

Mean Food Group Intake Over 24 Hours, District E

Food Group	Unadjusted Means (Standard Errors)		Results of Impact Models	
	Treatment Schools	Control Schools	Impact	Effect Size
	Number of Servings[1]			
Grain Products	**7.6 (0.12)**	**7.5 (0.14)**	**0.2**	**0.06**
Whole grains	1.1 (0.05)	1.1 (0.04)	0.1	0.07
Non-whole grains	6.4 (0.12)	6.4 (0.13)	0.1	0.04
Vegetables	**2.0 (0.06)**	**2.1 (0.06)**	**-0.1**	**-0.05**
Dark green vegetables	0.1 (0.01)	0.1 (0.01)	0.0	-0.06
Deep yellow vegetables	0.1 (0.01)	0.1 (0.01)	0.0	0.05
White potatoes	0.8 (0.05)	1.0 (0.05)	-0.2*	-0.11
Other starchy vegetables	0.2 (0.01)	0.1 (0.02)	0.0	0.02
Tomatoes	0.4 (0.02)	0.4 (0.02)	0.0	0.09
Cooked dry beans and peas	0.2 (0.02)	0.1 (0.01)	0.1	0.13
Other vegetables	0.5 (0.02)	0.5 (0.02)	0.0	0.03
Fruits	**1.6 (0.06)**	**1.6 (0.06)**	**0.1**	**0.03**
Citrus fruits, melons, and berries	0.6 (0.04)	0.6 (0.04)	0.0	0.00
Other fruits	1.0 (0.04)	1.0 (0.04)	0.1	0.05
Dairy Products	**2.5 (0.05)**	**2.5 (0.06)**	**0.0**	**-0.02**
Milk	1.9 (0.04)	1.9 (0.05)	0.0	-0.03
Yogurt	0.1 (0.01)	0.0 (0.01)	0.0	0.07
Cheese	0.6 (0.03)	0.6 (0.03)	0.0	-0.01
Meat and Meat Substitutes	**1.3 (0.03)**	**1.4 (0.04)**	**-0.1**	**-0.11**
Red meat (beef, pork, veal, lamb, game)	0.6 (0.03)	0.6 (0.03)	-0.1*	-0.11
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.3 (0.02)	0.2 (0.01)	0.1	0.14
Poultry (chicken, turkey, other)	0.3 (0.02)	0.3 (0.02)	0.0	-0.06
Fish and shellfish	0.1 (0.01)	0.1 (0.01)	0.0	-0.04
Eggs	0.1 (0.01)	0.1 (0.01)	0.0	-0.10
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.03
Nuts and seeds	0.1 (0.01)	0.1 (0.01)	0.0	0.00
Discretionary fat (gm)	57.7 (1.02)	58.0 (0.96)	-0.1	0.00
Added sugars (tsp)	23.4 (0.52)	23.7 (0.49)	-0.2	-0.02
Number of Students[3]	645	662		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-29

Mean Food Group Intake Over 24 Hours, District F

Food Group	Unadjusted Means (Standard Errors)		Results of Impact Models	
	Treatment Schools	Control Schools	Impact	Effect Size
	Number of Servings[1]			
Grain Products	**7.6 (0.29)**	**7.5 (0.36)**	**0.0**	**0.00**
Whole grains	0.6 (0.10)	0.7 (0.12)	-0.1	-0.10
Non-whole grains	7.0 (0.27)	6.8 (0.37)	0.1	0.04
Vegetables	**2.7 (0.18)**	**2.9 (0.25)**	**-0.2**	**-0.09**
Dark green vegetables	0.1 (0.03)	0.1 (0.04)	0.0	0.09
Deep yellow vegetables	0.1 (0.02)	0.1 (0.03)	0.0	0.00
White potatoes	1.3 (0.12)	1.6 (0.22)	-0.4	-0.21
Other starchy vegetables	0.2 (0.05)	0.3 (0.06)	-0.1	-0.13
Tomatoes	0.5 (0.05)	0.4 (0.05)	0.1	0.12
Cooked dry beans and peas	0.1 (0.02)	0.2 (0.06)	-0.1	-0.16
Other vegetables	0.5 (0.06)	0.4 (0.06)	0.1	0.17
Fruits	**1.6 (0.11)**	**1.5 (0.21)**	**0.2**	**0.10**
Citrus fruits, melons, and berries	0.6 (0.08)	0.6 (0.19)	0.0	0.01
Other fruits	1.1 (0.09)	0.9 (0.11)	0.2	0.16
Dairy Products	**2.6** (0.14)	**2.0** (0.12)	**0.6**	**0.44**
Milk	1.9 (0.12)	1.4 (0.11)	0.6	0.46
Yogurt	0.0 (0.00)	0.0 (0.01)	0.0	-0.13
Cheese	0.6 (0.06)	0.6 (0.07)	0.0	0.05
Meat and Meat Substitutes	**1.5 (0.14)**	**1.8 (0.14)**	**-0.3**	**-0.21**
Red meat (beef, pork, veal, lamb, game)	0.6 (0.07)	0.9 (0.14)	-0.3	-0.29
Organ meats	0.0 (0.00)	0.0 (0.00)	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.3 (0.05)	0.4 (0.04)	0.0	-0.08
Poultry (chicken, turkey, other)	0.3 (0.05)	0.4 (0.06)	0.0	-0.02
Fish and shellfish	0.2 (0.10)	0.1 (0.04)	0.1	0.09
Eggs	0.0 (0.01)	0.1 (0.02)	0.0	-0.19
Soybean products (tofu, meat analogues)	0.0 (0.00)	0.0 (0.00)	0.0	0.27
Nuts and seeds	0.1 (0.01)	0.1 (0.02)	0.0	0.00
Discretionary fat (gm)	65.9 (2.50)	64.2 (3.35)	1.4	0.05
Added sugars (tsp)	27.2 (1.38)	26.1 (1.41)	1.5	0.11
Number of Students[3]	119	90		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit D-30

Mean Percent of School Breakfast Food Wasted by Students[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
Food/Food Group	**N**	**Mean**	**N**	**Mean**	**Impact**	**Effect Size**
Milk	928	26.51 (1.04)	493	26.48 (1.32)	0.71	0.02
Fruits, juices and vegetables	850	16.97 (1.07)	437	16.09 (1.41)	1.41	0.05
Meats/Meat alternates	224	20.17 (2.35)	117	21.28 (3.15)	0.15	0.00
Grains/Breads	997	16.67 (0.88)	530	17.20 (1.16)	0.13	0.00
Combination entrees[2]	79	11.68 (2.97)	53	24.32 (4.76)	-8.60	-0.29
Other food items[3]	284	25.99 (2.19)	235	27.44 (2.42)	-3.30	-0.09
All Foods	1,085	21.14 (0.69)	567	22.57 (0.91)	-0.62	-0.03

[1] Based on self-reports of amount of food served and percent consumed. Percent food waste calculated as amount of food wasted (gm)/amount of food served (gm) × 100.

[2] Includes breakfast sandwiches, burritos, pizza, French toast, and sausage with pancake wrap.

[3] Foods that do not contribute to satisfying the meal patterns for the traditional or enhanced food-based menu planning systems.

Note: Estimate of difference in percent of food waste between treatment and control school students is not based on an experimental contrast.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit D-31

Mean Percent of Nutrients Wasted in School Breakfasts[1]

	Unadjusted Means (Standard Errors)		Results of Impact Models	
Dietary Component	**Treatment Schools Mean**	**Control Schools Mean**	**Impact**	**Effect Size**
Food Energy	19.06 (0.64)	20.88 (0.88)	-1.00	-0.05
Macronutrients				
Protein	21.78 (0.73)	23.55 (1.00)	-0.94	-0.04
Total fat	20.52 (0.76)	23.14 (1.09)	-1.50	-0.06
Saturated fat	21.90 (0.77)	24.12 (1.07)	-1.20	-0.05
Carbohydrate	17.97 (0.63)	19.39 (0.85)	-0.80	-0.04
Vitamins				
Vitamin A	20.21 (0.78)	20.31 (1.00)	0.24	0.01
Vitamin C	16.96 (0.79)	16.77 (1.04)	0.59	0.02
Vitamin B_6	17.15 (0.70)	16.64 (0.90)	0.79	0.03
Vitamin B_{12}	23.51 (0.88)	23.90 (1.12)	-0.01	0.00
Niacin	15.47 (0.73)	15.62 (0.93)	0.13	0.01
Thiamin	17.14 (0.68)	17.91 (0.89)	-0.36	-0.02
Riboflavin	19.98 (0.71)	20.85 (0.93)	-0.44	-0.02
Folate	16.44 (0.71)	16.58 (0.93)	0.24	0.01
Minerals				
Calcium	22.98 (0.81)	24.37 (1.07)	-0.62	-0.02
Iron	15.68 (0.71)	15.87 (0.94)	0.20	0.01
Magnesium	20.84 (0.69)	21.62 (0.92)	-0.07	0.00
Phosphorous	21.96 (0.75)	23.26 (1.00)	-0.53	-0.02
Zinc	18.06 (0.72)	17.98 (0.93)	0.45	0.02
Other Dietary Components				
Cholesterol	24.07 (0.89)	26.62 (1.22)	-1.70	-0.06
Sodium	18.85 (0.70)	20.94 (0.97)	-1.20	-0.05
Fiber	16.54 (0.73)	18.05 (1.05)	-0.80	-0.03
Number of Students	1085	567		

[1] Based on self-reports of amount of food served and percent consumed. Percent of nutrients wasted calculated as amount of nutrient wasted/amount of nutrient in food as served x 100.

Note: Estimate of difference in percent of nutrients wasted between treatment and control school students is not based on an experimental contrast.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001.*

Cognitive Functioning

Exhibit D-32

Stimulus Discrimination: Number of Trials Completed

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
	N	Mean	N	Mean	Impact	Effect Size
All	2185	73.08 (0.04)	2044	73.03 (0.04)	0.05	0.03
A	181	72.86 (0.10)	151	73.01 (0.11)	-0.12	-0.09
B	394	73.16 (0.11)	349	73.26 (0.13)	-0.08	-0.04
C	121	73.16 (0.13)	120	72.93 (0.14)	0.21	0.14
D	516	73.03 (0.09)	501	72.80 (0.05)	0.23	0.13
E	832	73.15 (0.07)	811	73.10 (0.07)	0.05	0.02
F	141	72.89 (0.15)	112	72.99 (0.16)	-0.11	-0.06

Notes: Stimulus discrimination is a computer-administered matching task.
Includes only children who completed the task (72 correct trials).

Source: *Impact Study – Cognitive Measures: Stimulus Discrimination, Spring 2001*

Exhibit D-33

Stimulus Discrimination: Decision Time[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2185	3.85 (0.03)	2044	3.87 (0.03)	0.00	0.00
A	181	3.73 (0.09)	151	3.97 (0.11)	-0.17	-0.13
B	394	3.57 (0.07)	349	3.66 (0.07)	0.02	0.02
C	121	4.05 (0.15)	120	4.08 (0.12)	-0.12	-0.08
D	516	3.61 (0.05)	501	3.60 (0.05)	0.04	0.03
E	832	4.15 (0.05)	811	4.08 (0.05)	0.03	0.02
F	141	3.77 (0.11)	112	3.81 (0.14)	-0.10	-0.08

[1] Time in seconds from first press of space bar to last release of space bar; average viewing time of stimuli.

Note: Includes only children who completed the task (72 correct trials).

Source: Impact Study – Cognitive Measures: Stimulus Discrimination, Spring 2001

Exhibit D-34

Stimulus Discrimination: Trial Time[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			Effect
District	N	Mean	N	Mean	Impact	Size
All	2185	4.44 (0.03)	2044	4.46 (0.03)	0.00	0.00
A	181	4.32 (0.10)	151	4.57 (0.12)	-0.19	-0.14
B	394	4.15 (0.07)	349	4.22 (0.07)	0.03	0.03
C	121	4.61 (0.15)	120	4.64 (0.12)	-0.12	-0.08
D	516	4.19 (0.06)	501	4.17 (0.06)	0.05	0.04
E	832	4.75 (0.05)	811	4.69 (0.05)	0.02	0.02
F	141	4.37 (0.12)	112	4.44 (0.15)	-0.14	-0.10

[1] Time in seconds from first press of space bar to answer; average viewing and response time.

Note: Includes only children who completed the task (72 correct trials).

Source: Impact Study – Cognitive Measures: Stimulus Discrimination, Spring 2001

Exhibit D-35

Digit Span: Scaled Score

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2181	9.25 (0.06)	2026	9.30 (0.06)	-0.04	-0.01
A	177	9.23 (0.20)	150	9.27 (0.23)	-0.04	-0.02
B	401	9.36 (0.15)	345	9.44 (0.16)	-0.01	0.00
C	122	8.92 (0.24)	121	8.63 (0.25)	0.32	0.12
D	497	9.61 (0.13)	487	9.41 (0.13)	0.17	0.06
E	837	9.11 (0.10)	804	9.36 (0.10)	-0.25	-0.09
F	147	8.93 (0.26)	119	8.76 (0.29)	0.18	0.06

Note: Digit Span is a series of orally presented number sequences that the child repeats verbatim for Digits Forward and in reverse order for Digits Backwards. Scores are combined to create a raw score that is then scaled based on the child's age in years and months.

Source: Impact Study – Cognitive Measures: Digit Span, Spring 2001

Exhibit D-36

Verbal Fluency: Animals[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2214	15.48 (0.10)	2069	15.55 (0.11)	-0.12++	-0.02
A	179	15.62 (0.34)	153	16.15 (0.39)	-0.69	-0.15
B	403	15.93 (0.25)	352	16.27 (0.28)	-0.54	-0.10
C	122	15.78 (0.40)	121	14.47 (0.41)	1.46	0.33
D	518	16.57 (0.22)	501	16.40 (0.22)	0.05	0.01
E	843	14.50 (0.15)	821	14.87 (0.15)	-0.35	-0.08
F	149	15.54 (0.35)	121	14.83 (0.40)	0.83	0.19

[1] Child was asked to name as many animals as possible in 60 seconds.

++ District-by-treatment interaction is statistically significant at the .01 level.

Source: Impact Study – Cognitive Measures: Verbal Fluency, Spring 2001

Exhibit D-37

Verbal Fluency: Things to Eat[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2215	14.50 (0.11)	2071	14.40 (0.11)	0.02+	0.00
A	180	14.96 (0.33)	153	15.27 (0.42)	-0.53	-0.11
B	403	14.98 (0.26)	353	15.06 (0.27)	-0.36	-0.07
C	122	13.38 (0.42)	121	12.74 (0.45)	0.83	0.17
D	518	15.76 (0.24)	502	14.84 (0.22)	0.71*	0.14
E	843	13.53 (0.16)	821	13.88 (0.16)	-0.31	-0.07
F	149	14.64 (0.40)	121	14.78 (0.42)	-0.01	0.00

[1] Child was asked to name as many things to eat as possible in 60 seconds.

* Difference is statistically significant at the .05 level.

+ District-by-treatment interaction is statistically significant at the .05 level.

Source: Impact Study – Cognitive Measures: Verbal Fluency, Spring 2001

Exhibit D-38

Verbal Fluency: Total[1]

District	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
	N	Mean	N	Mean	Impact	Effect Size
All	2214	29.97 (0.19)	2069	29.95 (0.19)	-0.10++	-0.01
A	179	30.54 (0.60)	153	31.42 (0.71)	-1.22	-0.15
B	403	30.91 (0.46)	352	31.35 (0.50)	-0.91	-0.10
C	122	29.16 (0.72)	121	27.21 (0.76)	2.30	0.28
D	518	32.33 (0.41)	501	31.23 (0.40)	0.77	0.08
E	843	28.03 (0.28)	821	28.76 (0.28)	-0.67	-0.08
F	149	30.19 (0.67)	121	29.61 (0.73)	0.81	0.10

[1] Combined score of animals and things to eat.

++ District-by-treatment interaction is statistically significant at the .01 level.

Source: Impact Study – Cognitive Measures: Verbal Fluency, Spring 2001

Emotional/Social Functioning

Exhibit D-39

Mean Scores on Pediatric Symptom Checklist (PSC)[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	1708	9.95 (0.13)	1655	9.80 (0.13)	0.22	0.04
A	153	9.50 (0.46)	127	8.24 (0.49)	1.27	0.23
B	256	10.53 (0.33)	262	10.06 (0.33)	0.58	0.11
C	96	10.48 (0.57)	97	9.67 (0.50)	0.74	0.14
D	433	9.94 (0.26)	416	9.52 (0.25)	0.54	0.10
E	645	9.79 (0.21)	658	10.01 (0.21)	-0.20	-0.04
F	125	9.82 (0.51)	95	11.01 (0.55)	-1.17	-0.21

[1] The PSC scale included 17 questions about the frequency of child behaviors; 1 point was counted for behaviors that occurred sometimes and 2 points for behaviors that occurred often.

Source: *Impact Study – Parent Survey, Spring 2001*

Exhibit D-40

Percent of Students with Psychosocial Impairment, as Indicated by Pediatric Symptom Checklist (PSC)[1]

	Unadjusted Percentages (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	%	N	%	Impact	Odds Ratio
All	1708	19.79 (0.96)	1655	18.55 (0.96)	1.56	1.10
A	153	17.65 (3.09)	127	14.96 (3.18)	2.23	1.18
B	256	21.88 (2.59)	262	17.94 (2.37)	4.97	1.36
C	96	26.04 (4.50)	97	15.46 (3.69)	10.60	1.93
D	433	20.09 (1.93)	416	15.38 (1.77)	5.81*	1.48
E	645	18.45 (1.53)	658	21.12 (1.59)	-2.65	0.85
F	125	19.20 (3.54)	95	24.21 (4.42)	-5.12	0.74

[1] The PSC scale included 17 questions about the frequency of child behaviors; 1 point was counted for behaviors that occurred sometimes and 2 points for behaviors that occurred often. Any child scoring higher than 15 points was categorized as having a psychosocial impairment.

*Difference is statistically significant at the .05 level.

Source: *Impact Study – Parent Survey, Spring 2001*

Student Behavior

Exhibit D-41

Conners' Teacher Rating Scale: Oppositional[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			Effect
District	N	Mean	N	Mean	Impact	Size
All	2028	52.25 (0.23)	1829	51.48 (0.22)	0.77*	0.08
A	171	52.19 (0.86)	121	50.64 (0.82)	1.61	0.16
B	347	52.40 (0.58)	263	50.74 (0.58)	1.45	0.14
C	112	52.09 (0.92)	106	50.98 (0.80)	1.22	0.13
D	483	51.92 (0.47)	479	51.01 (0.40)	0.96	0.10
E	786	52.51 (0.37)	747	52.08 (0.37)	0.42	0.04
F	129	51.76 (0.97)	113	52.66 (1.06)	-1.23	-0.11

[1] Individuals scoring high on this scale are likely to break rules, have problems with persons in authority, and are more easily annoyed and angered than most individuals their own age.

Note: Scores are scaled based on gender and age in years.

* Difference is statistically significant at the .05 level.

Source: Impact Study – Conners' Teacher Rating Scale (Revised Short Form), Spring 2001

Exhibit D-42

Conners' Teacher Rating Scale: Cognitive Problems/Inattention[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2084	53.45 (0.26)	1888	53.31 (0.26)	0.12	0.01
A	175	53.28 (0.89)	124	52.20 (0.99)	1.18	0.10
B	359	53.82 (0.65)	271	52.17 (0.70)	1.19	0.10
C	115	55.49 (1.12)	106	57.38 (1.12)	-1.84	-0.16
D	499	53.30 (0.53)	495	52.51 (0.48)	0.80	0.07
E	805	53.41 (0.41)	775	53.77 (0.41)	-0.29	-0.03
F	131	51.62 (0.91)	117	53.85 (1.13)	-2.14	-0.19

[1] High scorers may be inattentive. They may have more academic difficulty than most individuals their age, have problems organizing their work, have difficulty completing tasks or schoolwork, and appear to have trouble concentrating on tasks that require sustained mental effort.

Note: Scores are scaled based on gender and age in years.

Source: Impact Study – Conners' Teacher Rating Scale (Revised Short Form), Spring 2001

Exhibit D-43

Conners' Teacher Rating Scale: Hyperactivity[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2027	52.40 (0.23)	1832	51.93 (0.23)	0.43	0.04
A	169	53.11 (0.83)	119	52.33 (0.97)	0.68	0.06
B	347	52.55 (0.53)	263	51.13 (0.58)	1.47	0.15
C	111	54.39 (1.13)	106	52.27 (0.89)	2.15	0.20
D	487	52.19 (0.45)	475	50.92 (0.41)	1.36	0.14
E	784	52.10 (0.36)	754	52.52 (0.38)	-0.40	-0.04
F	129	51.96 (0.94)	115	53.35 (1.00)	-1.72	-0.16

[1] High scorers have difficulty sitting still, feel more restless and impulsive than most individuals their age, and have the need to always be on the go.

Note: Scores are scaled based on gender and age in years.

Source: Impact Study – Conners' Teacher Rating Scale (Revised Short Form), Spring 2001

Exhibit D-44

Conners' Teacher Rating Scale: ADHD Index[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2030	53.07 (0.24)	1842	52.63 (0.25)	0.42	0.04
A	168	53.39 (0.90)	120	52.81 (1.08)	0.58	0.05
B	350	53.80 (0.59)	266	51.84 (0.67)	1.77	0.16
C	111	54.72 (1.09)	103	53.77 (1.02)	0.94	0.09
D	489	52.98 (0.49)	481	51.57 (0.46)	1.43	0.14
E	783	52.70 (0.39)	757	53.19 (0.41)	-0.43	-0.04
F	129	51.84 (0.95)	115	53.90 (0.99)	-2.42	-0.23

[1] Identifies children/adolescents "at risk" for Attention Deficit Hyperactivity Disorder (ADHD).

Note: Scores are scaled based on gender and age in years.

Source: Impact Study – Conners' Teacher Rating Scale (Revised Short Form), Spring 2001

Exhibit D-45

Effortful Control: Ability to Focus

District	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
	N	Mean	N	Mean	Impact	Effect Size
All	2155	5.06 (0.03)	1993	5.09 (0.03)	-0.04	-0.02
A	177	4.94 (0.11)	129	5.09 (0.13)	-0.15	-0.10
B	364	5.04 (0.08)	282	5.20 (0.09)	-0.16	-0.11
C	152	5.00 (0.14)	157	5.07 (0.15)	-0.04	-0.03
D	511	5.06 (0.06)	499	5.15 (0.07)	-0.14	-0.10
E	816	5.09 (0.05)	804	5.02 (0.05)	0.06	0.04
F	135	5.21 (0.13)	122	5.03 (0.14)	0.15	0.10

Note: Items scored on a 7-point Likert scale ranging from Extremely Untrue of this Child (1) to Extremely True of this Child (7). A high score indicates good effortful control.

Source: Impact Study – Child Behavior Survey, Spring 2001

Exhibit D-46

Effortful Control: Ability to Follow Instructions

District	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
	N	Mean	N	Mean	Impact	Effect Size
All	2155	5.29 (0.03)	1993	5.30 (0.03)	-0.03	-0.02
A	177	5.16 (0.11)	129	5.35 (0.12)	-0.19	-0.13
B	364	5.26 (0.08)	282	5.44 (0.09)	-0.18	-0.13
C	152	5.21 (0.14)	157	5.28 (0.13)	-0.08	-0.06
D	511	5.37 (0.06)	499	5.35 (0.06)	-0.03	-0.02
E	816	5.28 (0.05)	804	5.23 (0.05)	0.04	0.02
F	135	5.34 (0.13)	122	5.21 (0.13)	0.15	0.10

Note: Items scored on a 7-point Likert scale ranging from Extremely Untrue of this Child (1) to Extremely True of this Child (7). A high score indicates good effortful control.

Source: Impact Study – Child Behavior Survey, Spring 2001

Exhibit D-47

School-Level Average Number of Daily Disciplinary Incidents[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	1443	1.13 (0.03)	1341	0.86 (0.02)	0.31*	0.27
A	154	0.44 (0.04)	151	0.59 (0.05)	-0.14	-0.25
B	220	1.10 (0.12)	206	0.58 (0.04)	0.64	0.47
C	74	1.10 (0.13)	73	0.56 (0.06)	0.59	0.69
D	330	1.12 (0.07)	320	0.96 (0.06)	0.16	0.14
E	569	1.36 (0.05)	505	1.03 (0.05)	0.34	0.29
F	96	0.94 (0.08)	86	0.93 (0.06)	0.03	0.04

[1] Logs of incidents represent the number of daily incidents per 100 students.

* Difference is statistically significant at the .05 level.

Source: *Impact Study – Logs of Visits by Students to the School Office for Disciplinary Reasons, Spring 2001*

Exhibit D-48

School-Level Average Number of Daily Disciplinary Incidents, by Time of Incident[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			Effect
District	**N**	**Mean**	**N**	**Mean**	**Impact**	**Size**
Morning Disciplinary Incidents						
All	1443	0.52 (0.02)	1341	0.39 (0.01)	0.16*	0.26
A	154	0.24 (0.03)	151	0.30 (0.03)	-0.04	-0.11
B	220	0.61 (0.07)	206	0.31 (0.03)	0.35	0.47
C	74	0.60 (0.08)	73	0.29 (0.04)	0.35	0.64
D	330	0.57 (0.04)	320	0.41 (0.03)	0.16	0.23
E	569	0.56 (0.03)	505	0.44 (0.02)	0.13	0.20
F	96	0.34 (0.04)	86	0.47 (0.04)	-0.12	-0.32
Afternoon Disciplinary Incidents						
All	1443	0.60 (0.02)	1341	0.48 (0.02)	0.15	0.20
A	154	0.20 (0.03)	151	0.29 (0.04)	-0.10	-0.25
B	220	0.49 (0.06)	206	0.27 (0.03)	0.29	0.39
C	74	0.51 (0.09)	73	0.27 (0.04)	0.25	0.42
D	330	0.55 (0.05)	320	0.55 (0.04)	0.00	0.00
E	569	0.80 (0.04)	505	0.60 (0.03)	0.21	0.27
F	96	0.60 (0.08)	86	0.47 (0.05)	0.14	0.23

[1] Logs of incidents represent the number of daily incidents per 100 students.

* Difference is statistically significant at the .05 level.

Source: *Impact Study – Logs of Visits by Students to the School Office for Disciplinary Reasons, Spring 2001*

Achievement Test Scores

Exhibit D-49

Student-Level Math Gain, All Grades Combined[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	1210	628.13 (1.24)	20.94	1187	627.84 (1.30)	23.61	-2.06	-0.05
A	55	622.02 (4.83)	27.67	44	627.43 (5.82)	28.52	-2.17	-0.06
B	268	611.03 (2.74)	25.44	221	609.60 (3.05)	24.07	2.63	0.06
C	81	609.47 (5.01)	26.35	85	603.18 (5.55)	32.34	-3.74	-0.08
D	281	634.50 (2.33)	19.01	299	629.91 (2.24)	22.42	-1.87	-0.05
E	462	636.76 (1.96)	17.79	483	638.68 (2.01)	22.97	-4.32	-0.10
F	63	638.56 (4.48)	20.61	55	633.04 (4.72)	16.37	9.22	0.28

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-50

Student-Level Second Grade to Third Grade Math Gain[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	103	584.00 (3.79)	25.17	88	572.32 (3.93)	24.70	3.13	0.08
B	79	583.89 (4.37)	23.62	68	577.68 (3.98)	19.22	6.69	0.18
C	24	584.38 (7.69)	30.29	20	554.10 (9.88)	43.35	0.26	0.01

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

[2] Schools in districts A, D, E, and F did not administer tests to students in second grade.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-51

Student-Level Third Grade to Fourth Grade Math Gain[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	548	618.36 (1.64)	21.72	554	614.78 (1.64)	28.48	-5.50**	-0.14
A	33	620.42 (5.12)	20.85	32	619.78 (6.70)	32.09	-10.97	-0.33
B	88	600.86 (3.51)	28.32	79	602.48 (3.89)	30.54	-1.79	-0.05
C	22	597.73 (8.63)	16.27	28	613.39 (8.72)	28.43	-12.11	-0.28
D	128	620.47 (3.40)	22.11	151	612.02 (2.98)	29.25	-4.91	-0.13
E	251	624.69 (2.49)	20.15	241	620.13 (2.59)	26.54	-4.76	-0.12
F	26	621.00 (6.34)	18.46	23	613.78 (5.64)	31.67	-6.64	-0.22

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

** Difference is statistically significant at the .01 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-52

Student-Level Fourth Grade to Fifth Grade Math Gain[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	299	635.40 (2.17)	25.98	300	638.73 (2.01)	23.76	2.29	0.06
A	22	624.41 (9.47)	37.91	12	647.83 (9.77)	19.00	22.53	0.54
B	56	633.18 (5.07)	27.52	40	635.15 (6.06)	24.58	5.26	0.14
C	16	626.94 (13.06)	27.81	18	607.72 (8.08)	25.67	-6.62	-0.15
D	73	634.60 (4.03)	16.72	66	637.42 (3.96)	18.32	-2.20	-0.07
E	112	639.96 (3.39)	28.07	146	644.14 (2.79)	27.48	-0.22	-0.01
F	20	637.80 (7.80)	29.15	18	632.58 (7.66)	12.97	17.08*	0.51

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

* Difference is statistically significant at the .05 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-53

Student-Level Fifth Grade to Sixth Grade Math Gain[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	260	657.86 (2.39)	11.80	245	663.96 (2.42)	12.02	-0.93	-0.02
B	45	651.00 (6.31)	20.44	34	659.94 (6.34)	18.15	-1.70	-0.04
C	19	640.05 (6.32)	31.79	19	635.47 (10.00)	32.84	4.93	0.14
D	80	656.87 (3.77)	16.14	82	656.82 (3.16)	13.13	3.31	0.11
E	99	663.75 (4.33)	0.17	96	676.93 (4.18)	7.16	-8.99	-0.21
F	17	666.32 (5.45)	13.85	14	665.25 (7.02)	-4.39	22.24	0.93

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

[2] Schools in district A are grades K-5.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-54

Student-Level Reading Gain, All Grades Combined[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	1193	641.72 (1.44)	17.60	1166	644.93 (1.55)	17.29	-1.07	-0.03
A	51	631.94 (5.86)	21.57	43	641.63 (7.02)	27.60	-8.83	-0.26
B	262	621.81 (2.85)	24.58	209	622.14 (3.40)	23.00	2.62	0.06
C	81	608.80 (5.49)	24.95	71	606.10 (6.22)	24.54	1.89	0.04
D	285	652.32 (2.64)	17.00	303	649.07 (2.49)	20.35	-1.89	-0.05
E	450	652.43 (2.40)	12.65	485	658.27 (2.52)	11.40	-1.79	-0.04
F	64	650.20 (5.06)	14.05	55	643.85 (5.79)	13.25	4.44	0.14

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-55

Student-Level Second Grade to Third Grade Reading Gain[1]

	Unadjusted Means						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N		Gain	N	Pre	Gain	Impact	Effect Size
All	101	594.17 (4.36)	27.98	80	581.90 (4.28)	28.55	2.42	0.06
B	76	599.62 (4.90)	26.51	65	588.23 (4.65)	27.63	1.99	0.05
C	25	577.60 (8.75)	32.44	15	554.47 (7.47)	32.53	6.22	0.16

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

[2] Schools in districts A, D, E, and F did not administer tests to students in second grade.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-56

Student-Level Third Grade to Fourth Grade Reading Gain[1]

	Unadjusted Means						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	541	634.28 (2.09)	21.65	545	633.79 (1.94)	24.78	-2.89	-0.06
A	32	620.72 (7.22)	26.44	31	631.00 (7.82)	33.35	-9.39	-0.22
B	88	611.38 (4.03)	34.53	74	617.72 (5.00)	27.57	7.16	0.18
C	22	598.32 (9.37)	27.77	23	604.61 (10.11)	27.87	4.94	0.11
D	129	638.91 (3.73)	24.73	153	632.37 (3.32)	30.47	-5.08	-0.12
E	244	645.77 (3.37)	14.80	240	643.19 (3.04)	18.26	-3.04	-0.06
F	26	628.21 (7.82)	16.02	24	629.92 (6.76)	31.17	-13.80	-0.38

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-57

Student-Level Fourth Grade to Fifth Grade Reading Gain[1]

	Unadjusted Means						Results of Impact Models	
	Treatment Schools			Control Schools				
District	**N**	**Pre**	**Gain**	**N**	**Pre**	**Gain**	**Impact**	**Effect Size**
All	298	652.91 (2.80)	13.07	299	659.83 (3.04)	8.79	1.80	0.04
A	19	650.84 (8.58)	13.37	12	669.08 (12.23)	12.75	-4.58	-0.12
B	57	640.86 (5.16)	16.91	39	652.46 (6.49)	13.79	0.30	0.01
C	16	625.00 (11.33)	17.25	17	617.65 (9.75)	24.65	-13.54	-0.32
D	75	662.59 (6.19)	2.65	67	661.75 (4.64)	5.29	-1.75	-0.04
E	110	654.58 (4.85)	18.55	147	665.78 (4.97)	8.27	5.09	0.09
F	21	665.48 (7.73)	7.69	17	653.35 (13.77)	-3.09	18.54	0.40

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-58

Student-Level Fifth Grade to Sixth Grade Reading Gain[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	253	663.42 (2.43)	10.14	242	672.48 (3.08)	7.19	0.24+	0.01
B	41	658.85 (7.18)	10.32	31	665.68 (6.80)	14.00	-6.24	-0.15
C	18	650.56 (7.13)	17.94	16	644.38 (12.48)	12.13	5.63	0.14
D	81	664.18 (3.54)	17.98	83	669.62 (4.34)	13.84	2.88	0.08
E	96	666.89 (4.36)	0.44	98	683.95 (5.60)	-0.72	-7.12	-0.14
F	17	664.94 (8.00)	18.91	14	656.21 (8.93)	2.39	19.79	0.60

[1] All test scores have been converted to Stanford-9 scale scores using the equipercentile equating method.

[2] Schools in district A are grades K-5.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

+ District-by-treatment interaction is statistically significant at the .05 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-59

Change in School-Level Math Score, All Grades Combined[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	257	54.28 (0.59)	-0.09	257	53.95 (0.55)	-0.38	0.36	0.04
A	12	53.09 (1.57)	0.67	12	52.16 (1.18)	1.36	-0.28	-0.06
B	60	53.05 (1.03)	0.66	60	52.13 (0.94)	0.06	0.84	0.11
C	20	49.09 (1.44)	1.57	20	47.01 (1.69)	2.78	-0.48	-0.07
D	68	55.56 (1.60)	2.06	68	56.32 (1.36)	0.23	1.62	0.13
E	81	55.28 (0.88)	-3.20	81	55.40 (0.90)	-2.18	-1.11	-0.14
F	16	55.88 (0.96)	1.15	16	53.41 (0.99)	-0.68	3.74*	0.93

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

* Difference is statistically significant at the .05 level.

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-60

Change in School-Level Second Grade Math Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N[3]	Pre	Change	N[3]	Pre	Change	Impact	Effect Size
All	16	51.06 (1.90)	0.88	16	49.01 (1.97)	1.61	-0.16	-0.02
B	12	51.99 (2.41)	0.13	12	50.48 (2.16)	1.06	-0.56	-0.07
C	4	48.25 (2.18)	3.13	4	44.58 (4.18)	3.28	0.81	0.13

[1] Based on normal curve equivalent scores.

[2] Schools in districts A, D, E, and F did not administer tests to students in second grade.

[3] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-61

Change in School-Level Third Grade Math Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	68	54.81 (1.06)	-0.07	68	54.32 (1.11)	-0.60	0.62	0.07
A	4	55.11 (1.94)	0.19	4	52.78 (3.08)	1.40	-0.28	-0.06
B	12	48.89 (2.46)	1.05	12	49.70 (2.18)	-2.31	3.13	0.40
C	4	53.40 (2.37)	-1.50	4	47.65 (4.41)	4.85	-5.09	-0.70
D	17	58.96 (2.71)	2.88	17	60.57 (2.54)	-1.86	4.50	0.42
E	27	54.66 (1.40)	-2.59	27	54.07 (1.59)	-0.85	-1.63	-0.21
F	4	57.02 (2.05)	2.12	4	51.48 (0.38)	4.20	0.08	0.02

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-62

Change in School-Level Fourth Grade Math Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	68	52.29 (0.93)	0.31	68	52.22 (0.94)	0.60	-0.27	-0.04
A	4	52.86 (2.71)	-0.07	4	51.37 (1.72)	2.93	-3.01	-0.70
B	12	52.68 (1.65)	-0.52	12	50.77 (2.09)	1.72	-2.26	-0.35
C	4	45.73 (4.69)	2.35	4	43.13 (2.61)	4.00	-0.93	-0.13
D	17	51.68 (2.60)	2.29	17	53.22 (2.37)	0.71	0.98	0.10
E	27	52.88 (1.25)	-0.81	27	53.59 (1.34)	-0.36	-0.60	-0.09
F	4	55.68 (1.39)	0.24	4	53.03 (3.00)	-2.45	3.23	0.71

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-63

Change in School-Level Fifth Grade Math Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	68	55.13 (1.26)	-2.61	68	55.14 (1.00)	-1.96	-0.65	-0.07
A	4	51.29 (3.69)	1.91	4	52.34 (1.57)	-0.25	1.53	0.29
B	12	54.86 (2.22)	0.45	12	52.73 (1.68)	0.28	0.53	0.08
C	4	48.08 (3.96)	-1.75	4	44.50 (3.16)	1.60	-1.12	-0.16
D	17	52.59 (3.55)	-0.93	17	54.27 (2.26)	1.11	-2.55	-0.21
E	27	58.28 (1.74)	-6.21	27	58.55 (1.59)	-5.32	-0.99	-0.12
F	4	56.43 (2.42)	0.01	4	56.45 (1.51)	-4.20	4.19	1.12

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: *Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001*

Exhibit D-64

Change in School-Level Sixth Grade Math Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N[3]	Pre	Change	N[3]	Pre	Change	Impact	Effect Size
All	37	56.83 (1.89)	3.39	37	56.42 (1.72)	0.28	3.20	0.29
B	12	56.83 (2.38)	2.18	12	56.98 (2.04)	-0.46	2.58	0.34
C	4	50.00 (2.69)	5.63	4	55.18 (2.34)	0.18	2.04	0.38
D	17	59.01 (3.62)	3.98	17	57.21 (3.44)	0.95	3.37	0.23
F	4	54.37 (2.25)	2.24	4	52.70 (1.87)	-0.28	2.92	0.74

[1] Based on normal curve equivalent scores.

[2] Schools in district A are grades K-5.

[3] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-65

Change in School-Level Reading Score, All Grades Combined[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	257	55.45 (0.65)	-0.01	257	55.28 (0.62)	-0.04	0.01	0.00
A	12	51.43 (1.41)	1.78	12	52.26 (0.96)	2.14	-0.55	-0.13
B	60	52.29 (0.91)	0.51	60	52.03 (0.76)	-0.12	0.75	0.11
C	20	44.67 (1.17)	0.67	20	43.35 (1.68)	-0.23	1.30	0.20
D	68	63.21 (1.68)	0.65	68	62.94 (1.45)	0.01	0.70	0.05
E	81	54.66 (0.78)	-1.16	81	55.20 (0.82)	-0.05	-1.40*	-0.20
F	16	54.81 (0.97)	-1.09	16	52.49 (0.85)	-1.24	2.34	0.62

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation - pre-implementation year

* Difference is statistically significant at the .05 level.

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-66

Change in School-Level Second Grade Reading Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N[3]	Pre	Change	N[3]	Pre	Change	Impact	Effect Size
All	16	50.44 (2.00)	0.69	16	48.88 (1.58)	0.29	0.82	0.12
B	12	52.44 (2.32)	0.83	12	50.28 (1.57)	1.37	0.10	0.02
C	4	44.45 (2.15)	0.28	4	44.68 (3.86)	-2.95	3.19	0.55

[1] Based on normal curve equivalent scores.

[2] Schools in districts A, D, E, and F did not administer tests to students in second grade.

[3] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-67

Change in School-Level Third Grade Reading Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	68	54.83 (1.17)	0.82	68	54.57 (1.18)	0.18	0.65	0.07
A	4	51.30 (2.15)	1.89	4	51.74 (2.05)	3.08	-1.35	-0.35
B	12	48.73 (2.12)	1.08	12	49.50 (1.61)	-1.00	2.04	0.32
C	4	45.13 (2.06)	-1.45	4	39.13 (5.23)	2.68	-2.89	-0.36
D	17	61.79 (3.05)	5.19	17	62.72 (2.46)	-0.96	6.18	0.55
E	27	55.42 (1.31)	-1.92	27	55.27 (1.39)	-0.12	-1.80	-0.26
F	4	52.75 (1.54)	1.14	4	48.70 (0.62)	5.18	-1.31	-0.43

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-68

Change in School-Level Fourth Grade Reading Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	68	55.35 (1.25)	0.50	68	56.09 (1.30)	0.71	-0.45	-0.04
A	4	52.09 (2.66)	1.37	4	52.17 (1.79)	2.75	-1.36	-0.32
B	12	52.53 (1.78)	1.46	12	53.66 (1.93)	-0.18	1.53	0.24
C	4	42.15 (3.37)	3.05	4	42.65 (4.03)	0.33	2.50	0.36
D	17	64.36 (3.27)	0.13	17	65.22 (3.20)	1.68	-1.90	-0.14
E	27	53.10 (1.28)	0.40	27	54.32 (1.56)	0.83	-0.70	-0.09
F	4	57.05 (1.29)	-3.55	4	53.88 (2.06)	-3.20	0.91	0.25

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-69

Change in School-Level Fifth Grade Reading Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N[2]	Pre	Change	N[2]	Pre	Change	Impact	Effect Size
All	68	54.94 (1.06)	-1.24	68	54.84 (0.98)	-0.70	-0.52	-0.06
A	4	50.91 (3.14)	2.09	4	52.88 (1.59)	0.60	0.83	0.18
B	12	53.79 (1.86)	-1.48	12	52.73 (1.70)	-0.98	-0.49	-0.08
C	4	44.08 (3.20)	0.10	4	42.88 (3.51)	-0.38	0.52	0.08
D	17	58.48 (2.73)	-0.81	17	58.09 (2.54)	0.17	-0.96	-0.09
E	27	55.47 (1.46)	-1.97	27	56.02 (1.31)	-0.87	-1.21	-0.17
F	4	54.71 (2.61)	-2.04	4	53.35 (1.08)	-4.13	2.27	0.60

[1] Based on normal curve equivalent scores.

[2] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit D-70

Change in School-Level Sixth Grade Reading Score[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[2]	N[3]	Pre	Change	N[3]	Pre	Change	Impact	Effect Size
All	37	59.88 (2.37)	-0.50	37	58.68 (1.91)	-0.72	0.52	0.04
B	12	53.93 (2.03)	0.67	12	54.00 (1.57)	0.21	0.44	0.07
C	4	47.55 (2.79)	1.35	4	47.43 (2.56)	-0.83	2.25	0.45
D	17	68.19 (4.05)	-1.89	17	65.72 (3.17)	-0.85	-0.43	-0.03
F	4	54.73 (2.22)	0.08	4	54.03 (1.46)	-2.83	3.08	0.88

[1] Based on normal curve equivalent scores.

[2] Schools in district A are grades K-5.

[3] Based on number of grades across schools.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Attendance and Tardiness

Exhibit D-71

Student-Level Attendance Gain[1]

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	1885	95.75 (0.10)	-0.23	1793	95.65 (0.09)	0.06	-0.23	-0.06
A	159	96.07 (0.26)	-0.44	109	96.39 (0.30)	0.20	-0.64	-0.20
B	326	95.40 (0.24)	-0.04	279	95.00 (0.26)	0.22	-0.06	-0.01
C	111	94.80 (0.41)	0.27	114	95.34 (0.43)	-0.20	0.21	0.05
D	438	96.30 (0.26)	-0.12	460	96.25 (0.16)	0.05	-0.15	-0.03
E	742	95.60 (0.14)	-0.44	722	95.46 (0.15)	0.01	-0.40*	-0.10
F	109	96.14 (0.36)	-0.01	109	95.56 (0.32)	0.24	0.05	0.01

[1] Based on average percent of days student present.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

* Difference is statistically significant at the .05 level.

Source: Impact Study – Student-Level Attendance Data, 1999-2000 and 2000-2001

Exhibit D-72

Change in School-Level Average Daily Attendance

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District	N	Pre	Change	N	Pre	Change	Impact	Effect Size
All	69	93.94 (0.43)	-0.06	69	94.06 (0.36)	-0.23	0.09	0.03
A	5	95.27 (0.43)	-0.43	5	95.60 (0.80)	-0.25	-0.34	-0.25
B	12	89.39 (1.21)	0.50	12	89.78 (0.96)	-0.35	0.64	0.17
C	4	93.51 (1.29)	-1.04	4	92.87 (0.90)	1.05	-1.40	-0.67
D	17	94.52 (1.08)	0.50	17	95.18 (0.46)	0.08	-0.23	-0.07
E	27	95.32 (0.16)	-0.44	27	95.43 (0.17)	-0.49	0.02	0.02
F	4	94.62 (1.16)	-0.04	4	92.07 (1.98)	-0.64	1.03	0.31

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Attendance Data, 1999-2000 and 2000-2001

Exhibit D-73

Student-Level Days Tardy as a Percent of School Days Enrolled

	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
District[1]	N	Pre	Gain	N	Pre	Gain	Impact	Effect Size
All	1076	1.10 (0.08)	1.08	975	1.48 (0.12)	0.99	-0.17	-0.05
A	159	1.64 (0.23)	1.57	108	2.33 (0.39)	1.00	-0.09	-0.03
B	325	0.00 (0.00)	1.99	261	0.00 (0.00)	2.80	-0.85	na[2]
C	111	1.87 (0.30)	0.13	114	1.82 (0.31)	-0.40	0.54	0.17
D	435	1.64 (0.15)	0.54	447	2.20 (0.21)	0.35	0.00	0.00
F	46	0.00 (0.00)	0.29	45	0.02 (0.02)	0.29	0.03	-0.28

na = not applicable.

[1] Data were not available for District E.

[2] Effect size could not be computed because there was no variation between groups in Year 1.

Notes: Pre = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Source: *Impact Study – Student-Level Attendance Data, 1999-2000 and 2000-2001*

Exhibit D-74

Change in School-Level Days Tardy as a Percent of School Days Enrolled

District[1]	Unadjusted Means (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
	N	Pre	Change	N	Pre	Change	Impact	Effect Size
All	19	1.84 (0.15)	0.25	19	1.95 (0.24)	0.06	0.14	0.16
C	4	1.73 (0.38)	0.05	4	1.82 (0.52)	0.11	-0.08	-0.10
D	15	1.87 (0.17)	0.31	15	1.99 (0.28)	0.05	0.20	0.23

[1] Data were not available for Districts A, B, E, and F.

Notes: Pre = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

Source: Impact Study – School-Level Attendance Data, 1999-2000 and 2000-2001

Food Insecurity

Exhibit D-75

Percent of Food Secure Households[1]

	Unadjusted Percentages (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	%	N	%	Impact	Odds Ratio
All	1714	77.71 (0.01)	1661	76.88 (0.01)	0.59	1.03
A	153	81.05 (0.03)	127	85.04 (0.03)	-4.60	0.72
B	256	81.64 (0.02)	263	78.33 (0.03)	1.99	1.13
C	96	64.58 (0.05)	97	53.61 (0.05)	11.33	1.60
D	439	82.00 (0.02)	421	80.76 (0.02)	1.29	1.09
E	645	74.73 (0.02)	658	75.68 (0.02)	-0.86	0.95
F	125	76.00 (0.04)	95	76.84 (0.04)	-0.69	0.96

[1] Based on food insecurity scale scores; a score of less than 2 indicates that a household is food secure.

Source: *Impact Study – Parent Survey, Spring 2001*

Exhibit D-76

Household Food Insecurity Scale Scores[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	1714	1.04 (0.04)	1661	1.10 (0.04)	-0.04	-0.02
A	153	0.81 (0.11)	127	0.63 (0.13)	0.17	0.12
B	256	0.87 (0.11)	263	1.10 (0.12)	-0.16	-0.09
C	96	1.59 (0.20)	97	2.18 (0.21)	-0.52	-0.26
D	439	0.87 (0.08)	421	0.99 (0.08)	-0.11	-0.06
E	645	1.20 (0.07)	658	1.14 (0.07)	0.06	0.04
F	125	0.99 (0.14)	95	0.94 (0.16)	0.08	0.05

[1] Lower scores indicate greater food security.

Source: *Impact Study – Parent Survey, Spring 2001*

Exhibit D-77

Child Food Insecurity Scale Scores[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	1714	1.01 (0.05)	1661	1.07 (0.05)	-0.03+	-0.02
A	153	0.78 (0.13)	127	0.50 (0.12)	0.27	0.18
B	256	0.84 (0.12)	263	1.11 (0.13)	-0.18	-0.09
C	96	1.61 (0.22)	97	2.49 (0.26)	-0.81	-0.34
D	439	0.82 (0.09)	421	0.92 (0.09)	-0.11	-0.06
E	645	1.19 (0.08)	658	1.06 (0.07)	0.13	0.07
F	125	0.98 (0.16)	95	0.96 (0.18)	0.08	0.05

[1] Lower scores indicate greater food security.

+ District-by-treatment participation interaction is statistically significant at the .05 level.

Source: Impact Study – Parent Survey, Spring 2001

Child Health

Exhibit D-78

Body Mass Index (BMI) Percentile[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	2183	64.56 (0.61)	2059	63.40 (0.63)	1.11	0.04
A	179	69.20 (2.03)	153	65.88 (2.29)	3.31	0.12
B	378	64.56 (1.46)	349	61.43 (1.60)	3.12	0.11
C	121	72.00 (2.30)	121	69.86 (2.48)	2.22	0.08
D	518	56.58 (1.31)	500	55.05 (1.29)	1.71	0.06
E	840	66.09 (0.96)	819	66.56 (0.97)	-0.44	-0.02
F	147	72.18 (2.11)	117	73.00 (2.39)	-1.46	-0.06

[1] BMI percentiles, based on student's age and gender, were determined using methods and growth curves published by the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), 2000.

Source: Impact Study – Height and Weight Measurements, Spring 2001

Exhibit D-79

Prevalence of Risk of Overweight and Overweight Based on Students' BMI Percentile

	Unadjusted Percentages (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District/Measure	N	%	N	%	Impact	Odds Ratio
All						
At risk of overweight[1]	2183	33.72 (1.01)	2059	31.71 (1.03)	1.80	1.09
Overweight[2]	2183	16.86 (0.80)	2059	17.73 (0.84)	-1.03	0.93
A						
At risk of overweight	179	41.34 (3.69)	153	35.95 (3.89)	4.74	1.22
Overweight	179	17.88 (2.87)	153	18.95 (3.18)	-1.13	0.93
B						
At risk of overweight	378	34.13 (2.44)	349	30.95 (2.48)	2.86	1.14
Overweight	378	18.78 (2.01)	349	16.62 (2.00)	2.20	1.16
C						
At risk of overweight	121	41.32 (4.50)	121	38.02 (4.43)	3.61	1.16
Overweight	121	25.62 (3.98)	121	24.79 (3.94)	0.98	1.05
D						
At risk of overweight	518	24.32 (1.89)	500	19.60 (1.78)	4.84	1.33
Overweight	518	9.46 (1.29)	500	9.20 (1.29)	0.40	1.05
E						
At risk of overweight	840	34.88 (1.65)	819	35.41 (1.67)	-0.58	0.97
Overweight	840	17.50 (1.31)	819	20.02 (1.40)	-2.60	0.84
F						
At risk of overweight	147	43.54 (4.10)	117	47.86 (4.64)	-4.41	0.84
Overweight	147	25.85 (3.62)	117	32.48 (4.35)	-7.09	0.71

[1] Based on BMI at or above the 85th percentile (includes overweight students).

[2] Based on BMI at or above the 95th percentile.

Source: Impact Study – Height and Weight Measurements, Spring 2001

Exhibit D-80

Percent of Students Reported to Be In Excellent Health

	Unadjusted Percentages (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	%	N	%	Impact	Odds Ratio
All	1710	57.72 (1.19)	1657	55.10 (1.22)	2.46	1.11
A	153	60.78 (3.96)	127	64.57 (4.26)	-3.66	0.86
B	255	63.92 (3.01)	262	56.87 (3.07)	6.42	1.31
C	96	53.13 (5.12)	96	42.71 (5.08)	9.74	1.48
D	437	59.95 (2.35)	419	59.67 (2.40)	0.13	1.01
E	645	53.33 (1.97)	658	52.89 (1.95)	0.50	1.02
F	124	59.68 (4.42)	95	45.26 (5.13)	14.50*	1.80

* Difference is statistically significant at the .05 level.

Source: *Impact Study – Parent Survey, Spring 2001*

Exhibit D-81

Percent of Students Reported to Have a Health Problem[1]

District	Unadjusted Percentages (Standard Errors)						Results of Impact Models	
	Treatment Schools			Control Schools				
	N	%		N	%		Impact	Odds Ratio
All	1707	19.27	(0.95)	1649	20.44	(0.99)	-0.92	0.94
A	153	16.34	(3.00)	127	16.54	(3.31)	-0.64	0.95
B	255	23.53	(2.66)	261	22.99	(2.61)	0.36	1.02
C	94	14.89	(3.69)	96	9.38	(2.99)	6.95	1.89
D	436	18.12	(1.85)	415	19.04	(1.93)	-0.34	0.98
E	645	19.69	(1.57)	657	22.83	(1.64)	-3.09	0.83
F	124	19.35	(3.56)	93	19.35	(4.12)	-0.13	0.99

[1] Health problem is defined as having an impairment or health problem that lasted, or is expected to last, 12 months or longer.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit D-82

Percent of Students Reported to Have Improved Health[1]

District	Treatment Schools N	Treatment Schools %	Treatment Schools (SE)	Control Schools N	Control Schools %	Control Schools (SE)	Impact	Odds Ratio
	Unadjusted Percentages (Standard Errors)						Results of Impact Models	
All	1707	18.69	(0.94)	1657	20.88	(1.00)	-2.14	0.87
A	153	16.99	(3.05)	127	24.41	(3.83)	-7.49	0.63
B	254	21.26	(2.57)	262	20.99	(2.52)	0.68	1.04
C	96	21.88	(4.24)	96	22.92	(4.31)	-1.38	0.92
D	436	15.83	(1.75)	419	18.14	(1.88)	-3.01	0.80
E	644	19.10	(1.55)	658	21.88	(1.61)	-2.87	0.84
F	124	20.97	(3.67)	95	18.95	(4.04)	1.94	1.13

[1] Health reported as better when comparing this year to last year.

Source: Impact Study – Parent Survey, Spring 2001

Exhibit D-83

School-Level Average Number of Daily Health Office/Nurse Visits[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	N	Mean	N	Mean	Impact	Effect Size
All	1464	3.89 (0.07)	1332	3.95 (0.07)	-0.05	-0.02
A	153	3.35 (0.21)	150	3.32 (0.14)	0.29	0.13
B	227	3.53 (0.10)	208	4.32 (0.20)	-0.71	-0.31
C	73	2.72 (0.15)	73	2.46 (0.13)	0.23	0.19
D	328	4.81 (0.17)	318	4.25 (0.11)	0.53	0.21
E	587	3.90 (0.12)	506	4.08 (0.13)	-0.17	-0.06
F	96	3.22 (0.20)	77	3.47 (0.25)	-0.44	-0.21

[1] Logs of visits represent the number of weekly visits per 100 students.

Source: *Impact Study – Logs of Vists by Students to the Health Office/School Nurse, Spring 2001*

Exhibit D-84

School-Level Average Number of Daily Health Office/Nurse Visits, by Time of Visit[1]

	Unadjusted Means (Standard Errors)				Results of Impact Models	
	Treatment Schools		Control Schools			
District	**N**	**Mean**	**N**	**Mean**	**Impact**	**Effect Size**
Morning Health Office/Nurse Visits						
All	1464	2.26 (0.04)	1332	2.17 (0.04)	0.06	0.04
A	153	2.05 (0.11)	150	1.93 (0.09)	0.16	0.13
B	227	2.23 (0.07)	208	2.57 (0.11)	-0.31	-0.23
C	73	1.85 (0.11)	73	1.73 (0.09)	0.10	0.12
D	328	2.79 (0.11)	318	2.30 (0.09)	0.47	0.26
E	587	2.02 (0.07)	506	2.08 (0.07)	-0.07	-0.04
F	96	2.60 (0.18)	77	2.01 (0.15)	0.28	0.18
Afternoon Health Office/Nurse Visits						
All	1464	1.63 (0.05)	1332	1.78 (0.04)	-0.12	-0.07
A	153	1.29 (0.13)	150	1.39 (0.07)	0.13	0.10
B	227	1.30 (0.06)	208	1.75 (0.11)	-0.40	-0.32
C	73	0.88 (0.09)	73	0.73 (0.09)	0.13	0.17
D	328	2.02 (0.12)	318	1.94 (0.08)	0.07	0.04
E	587	1.89 (0.08)	506	2.00 (0.08)	-0.10	-0.05
F	96	0.63 (0.09)	77	1.46 (0.13)	-0.71	-0.72

[1] Logs of visits represent the number of weekly visits per 100 students.

Source: *Impact Study – Logs of Vists by Students to the Health Office/School Nurse, Spring 2001*

APPENDIX E

METHODOLOGY FOR FOOD AND NUTRIENT ANALYSIS OF STUDENTS' DIETS

List of Exhibits

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Appendix E

Methodology for Food and Nutrient Analysis of Students' Diets

This appendix discusses the approach to several of the methodological issues unique to the food and nutrient analysis of students' diets. The succeeding sections cover the following issues: defining which foods consumed constitute "breakfast;" selecting dietary reference standards; estimating the distribution of students' usual nutrient intake; and determining Food Guide Pyramid food group servings. The final section also includes the Pyramid serving recommendations for children.

Defining Which Foods to Call "Breakfast"

There were two possible approaches to defining which foods constitute breakfast: (1) to include all foods reported eaten during a specified period of the morning, and (2) to include all foods reported consumed as part of eating occasions the student called breakfast. A combination of these approaches was ultimately adopted. Foods were counted as part of breakfast primarily according to the times they were consumed, but students' reports of their eating occasion were used to capture school breakfast meals served mid-morning rather than at the start of school.

This approach was based on the methods used in the first *School Nutrition Dietary Assessment Study* (SNDA-1) and the recent FNS study of children's diets and their relationship to school meal participation, based on the 1994-1996 Continuing Survey of Food Intakes of Individuals (CSFII) (Gleason and Suitor, 2001). SNDA-1 included as breakfast foods reported consumed between midnight and 45 minutes after the start of school. In the current evaluation, however, it was found that most of the foods students consumed between midnight and 5:00 a.m. were more appropriately categorized as snacks.[1] The study of the CSFII sample used a specified time period for defining breakfast of 5:00 a.m. to 9:30 a.m. This applied only to school days; different time periods were used for holidays and weekend days. They also included as part of breakfast the foods students' defined as breakfast that were eaten up to an hour after the defined breakfast period (i.e., foods eaten between 9:30 a.m. and 10:30 a.m. on school days).

Since all data for the evaluation were collected on school days and because school start times (and the time periods during which school breakfast was served) varied considerably across participating districts, it seemed reasonable to include as breakfast, all foods consumed between 5:00 a.m. and 45 minutes after the start of school. In addition, since several schools in District C and at least one school in District D served school breakfast mid-morning, we expanded this to include *all foods consumed between 5:00 a.m. and 45 minutes after the start of school and foods consumed up to 10:30 a.m. that the student reported as being part of breakfast.*

Expanding our criteria to breakfasts eaten by 10:30 a.m. captured all of the students eating school breakfast and the small number of breakfasts eaten after the 45-minute-after-start-of-school mark from other sources. A review of the other foods students reported eating between 45 minutes after the start of school and 10:30 a.m. confirmed they were appropriately called "snacks."[2] Furthermore, the vast majority of students who ate something other than breakfast during this time period had eaten a breakfast or snack earlier in the day.

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[1] Only one student called foods eaten between midnight and 5:00 a.m. "breakfast."

Use of Dietary Reference Standards and Recommendations

Five sources of dietary recommendations were used to describe and assess students' dietary intake for this evaluation. They include: (1) Dietary Reference Intakes (DRIs) (IOM, 1997, 1998, 2000b, and 2001), (2) 1989 Recommended Dietary Allowances (RDAs) for food energy and other nutrients for which DRIs have not yet been established (NRC, 1989a), (3) 2000 *Dietary Guidelines for Americans* (USDHHS and USDA, 2000), (4) the National Research Council's *Diet and Health* report (1989b), and (5) the recommendation of the American Health Foundation for dietary fiber intake in children (Williams, 1995). The DRIs, a new set of dietary reference standards that differ from the former RDAs, are further described below. The specific nutrients and dietary components covered by the remaining standards and recommendations are simply listed as they have been used fairly extensively in other dietary studies.

Beginning in 1997, the Food and Nutrition Board (FNB) of the Institute of Medicine began releasing reports presenting dietary reference values for the intake of nutrients by Americans. The development of DRIs replaces RDAs published by the National Academy of Sciences with new values to be used for planning and assessing diets for individuals and groups. The DRIs consist of four types of reference values: the Estimated Average Requirement (EAR), the RDA, the Adequate Intake (AI), and the Tolerable Upper Intake Level (UL).[3] The EAR is an intake level estimated to meet the nutrient requirement of 50 percent of individuals in a given age and gender group. According to guidance from the FNB, the EAR is the only appropriate reference value that should be used to assess the prevalence of inadequate (or adequate) intakes within a group (IOM, 2000a). The new RDA is set at a level two standard deviations above the EAR. As such, the RDA is the average daily intake level sufficient to meet the nutrient requirement of 97 to 98 percent of individuals in a given group. It is not appropriate for assessing the adequacy of intake because, according to the FNB, "a serious overestimation of the proportion of the group at risk of inadequacy would result." The AI is established when data are not sufficient to determine an EAR (or RDA). It is based on the average observed intake of the nutrient or experimentally-determined estimates of intake in a group of healthy people. Use of the AI to assess diet adequacy is complex and not recommended, especially when mean intakes of a group are below the AI (IOM, 2000a).

DRIs (an EAR and RDA) were available for 13 of the nutrients for which dietary intake was analyzed in this report. An AI rather than an EAR and RDA was available for one of these (calcium). In this report RDAs are used only to describe and compare the mean nutrient intake of treatment and control school students (e.g., vitamin C intake is expressed as a percent of RDA). To assess nutrient adequacy, as recommended by the FNB Subcommittees on Dietary Reference Intakes, the proportion of students whose usual intake met or exceeded the EAR was determined. The exceptions were for intakes of food energy, protein and calcium. At the time of writing this report, DRIs were not yet available for food energy or the macronutrients, and for calcium, only an AI was available. Alternatively, the 1989 RDAs were used for these nutrients. A value of 80 percent of the 1989 RDA was selected as a cut-off to try and minimize the problem of overestimation of nutrient inadequacy.[4] In addition, means and the distributions of usual intake (5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles) were presented as an alternative means of comparing intake of these nutrients. Exhibit E-1 shows both the 1989 RDA and DRI values used to describe and assess students' diets in this report.

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[2] Some examples of these foods include snack chips, cookies, soft drinks, candy, granola bars, crackers and fruit.

[3] This report does not consider ULs.

The latest edition (2000) of the *Dietary Guidelines for Americans* and NRC's *Diet and Health* report were used to assess students' macronutrient intake. The *Dietary Guidelines* provide quantitative recommendations for intake of total fat and saturated fat as a percent of food energy. The NRC recommendations include guidelines for carbohydrate, protein, cholesterol, and sodium. Both sets of reference standards are intended to apply to children two years of age and older. The specific recommendations for usual daily intake are as follows:

- No more than 30 percent of total food energy from total fat;
- Less than 10 percent of total food energy from saturated fat;
- At least 55 percent of total food energy from carbohydrate;
- No more than twice the RDA for protein;
- No more than 300 mg of cholesterol; and
- No more than 2,400 mg of sodium.

Recommendations for fiber intake have been debated, but it is generally agreed that dietary fiber is important to children's health. Williams (1995) has promoted a recommendation from the American Health Foundation to increase dietary fiber intake using an "age plus 5" grams per day rule for children older than two years of age. This recommendation was adopted in the recent USDA study of children's diets (Gleason and Suitor, 2001), as well as a number of other studies. Based on the age plus 5 recommendation, minimum daily fiber intakes for students in the SBPP sample were compared to values ranging from 12 to 18 grams per day. Mean dietary fiber intakes were reported both in grams and as a percent of the age plus 5 recommended values.

Estimating Usual Intake

The assessment of students' dietary adequacy and conformity with national dietary recommendations requires an estimate of usual intake. Usual intake, defined as the long-run average of daily intakes of a particular nutrient, cannot practically or accurately be directly measured. An alternative means of measuring usual intake is based on the assumption that individuals can more accurately recall and describe the types and amounts of foods consumed yesterday than over longer periods of time. Collecting 24-hour recall data for a few randomly selected days is a first step, however there are still the problems of response error and the individual's day-to-day variability in consumption. Because the range of average intakes for individuals is greater than the range of average intakes across the entire population, estimates of the proportion of individuals with adequate intakes will be biased.

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[4] This value was selected to be consistent with analyses of children's diets using data from the 1994-96 CSFII (Gleason and Suitor, 2001). It may or may not accurately reflect the average requirement for these nutrients.

Exhibit E-1

1989 Recommended Dietary Allowances and Dietary Reference Intakes Used in the SBPP, By Age and Gender[1]

	Children 4 to 8	Children 7 to 10	Males 9 to 13, 11 to 14[2]	Females 9 to 13, 11 to 14[2]
Food Energy (kcal)				
1989 RDA	na	2,000	2,500	2,300
80% of 1989 RDA	na	1,600	2,000	1,760
Protein (g)				
1989 RDA	na	28	45	46
80% of 1989 RDA	na	22.4	36	36.8
Vitamin A (mcg)[3]				
2001 RDA	400	na	600	600
2001 EAR	275	na	445	420
Vitamin C (mg)				
1998 RDA	25	na	45	45
1998 EAR	22	na	39	39
Vitamin B_6 (mg)				
1998 RDA	0.6	na	1.0	1.0
1998 EAR	0.5	na	0.8	0.8
Vitamin B_{12} (mcg)				
1998 RDA	1.2	na	1.8	1.8
1998 EAR	1.0	na	1.5	1.5
Thiamin (mg)				
1998 RDA	0.6	na	0.9	0.9
1998 EAR	0.5	na	0.7	0.7
Riboflavin (mg)				
1998 RDA	0.6	na	0.9	0.9
1998 EAR	0.5	na	0.8	0.8
Niacin (mg)				
1998 RDA	8	na	12	12
1998 EAR	6	na	9	9
Folate (mcg)				
1998 RDA	200	na	300	300
1998 EAR	160	na	250	250
Calcium (mg)				
1989 RDA	na	800	1,200	1,200
80% of 1989 RDA	na	640	960	960
1997 AI	800	na	1,300	1,300
Iron (mg)				
2001 RDA	10	na	8	8
2001 EAR	4.1	na	5.9	5.7
Magnesium (mg)				
1997 RDA	130	na	240	240
1997 EAR	110	na	200	200
Phosphorous (mg)				
1997 RDA	500	na	1,250	1,250
1997 EAR	405	na	1,055	1,055
Zinc (mg)				
2001 RDA	5	na	8	8
2001 EAR	4	na	7	7

na = not applicable

[1] The age range of the SBPP student sample was 7 to 13 years.

[2] Age range for 1989 RDAs.

[3] For comparisons with DRIs, the Vitamin A content of students' diets was calculated as: Vitamin A=total Vitamin A (RE) – 0.5 * total carotenes (RE) (Trumbo et al., 2001).

Source: Institute of Medicine (1997, 1998 and 2000b) and National Research Council (1989a)

A 1986 report by the NRC marked the first attempt to develop a method of estimating usual intake distributions that adjusted observed daily intake values for within-person variability (NRC, 1986). This method determines and partially removes the effects of day-to-day variability in intakes when estimating the usual intake distribution of a population. A group of researchers at Iowa State University (ISU), in collaboration with USDA, later extended the NRC approach, accounting for the fact that intake distributions for many dietary components are right skewed (Nusser et al., 1996).[5] With the ISU method, daily intake data are adjusted first for "nuisance" effects (e.g., day of the week, intake day, sample characteristics). Second, the intake data are adjusted to have a mean and variance equal to that of the first sample day because it is considered to be most accurate. The resulting estimates of the percentiles of the intake distribution have been shown to be less biased than other methods (Carriquiry, 1999).

The methods developed by Nusser and colleagues were used in this evaluation to generate percentile values of the usual intake distribution for treatment and control school students and to determine the proportions of students in these groups whose usual intake was above or below dietary reference standards. The Software for Intake Distribution Estimation (C-SIDE) was used to apply these procedures (Iowa State University, 1996). The ISU method for estimating the distribution of usual intake requires multiple 24-hour recalls (two or more) on at least a subsample of the study population. As discussed in the main body of this report, two non-consecutive 24-hour recall interviews were conducted with a random subsample of 12 percent of the SBPP student sample. While this provided sufficient information on intra-individual variation to estimate usual intake distributions for the main impact analyses, the number of replicate observations was too small to support analyses at the district level or for some subgroups.[6]

Determining Food Group Servings

In addition to examining the nutrient content of students' diets, the assessment of dietary intake for this evaluation included a description of students' food intake. The number of servings of foods consumed from the five major food groups and 22 subgroups of the Food Guide Pyramid was estimated for each student, both at breakfast and over 24 hours. Intakes of discretionary fat and teaspoons of added sugar were also assessed. Since intake data were only available for one day for all students, and since it was not possible to estimate usual food intake even with two days of intake data for a subsample of students, only the mean numbers of servings were compared for treatment and control school students. That is, we did not attempt to determine the proportions of students consuming minimum recommended numbers of servings from each Pyramid food group as the recommendations are meant to be achieved over time.

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[5] Neither the NRC or the ISU method can be used to estimate the distribution of usual food intake because many foods are consumed on only a few sample days by only a fraction of the population. Thus, data for infrequently consumed foods contain many zero values (Nusser et al., 1996).

[6] This was mainly due to a limitation of the C-SIDE software which does not allow multiple values of the EAR and other dietary reference standard cut-offs to be specified when they differ by age and gender for a particular dietary component. C-SIDE had to be run separately for multiple subgroups of the SBPP student sample even for the main impact analysis.

Linking NDS-R and USDA Survey Food Codes

To compute the number of Food Guide Pyramid food group servings consumed by students, it was decided to take advantage of the Pyramid Servings Database for USDA Survey Foods Codes (2000). The database, developed by the Community Nutrition Research Group of the Agricultural Research Service (ARS), contains the number of Pyramid servings in 100 grams of food code reported in the 1994-96, 1998 Continuing Survey of Food Intakes of Individuals (CSFII). Although the Nutrition Data System for Research (NDS-R) allows for food-based analyses, the food grouping scheme available is not based on the Food Pyramid food groups. Other researchers have manipulated the food- and ingredient-level data files generated by the NDS-R to obtain estimates of Food Pyramid food group servings[7], however this approach would have involved a considerable commitment of resources. Use of the Pyramid Servings Database also facilitates comparisons with other USDA-sponsored studies of children's food intake.

In order to utilize the USDA Pyramid serving data, it was necessary to link each of the NDS-R food codes to a USDA/ARS-defined food code. There were a total of 62,329 unique foods reported consumed from the 24-hour dietary recall interviews. For many foods (79 percent), the linking was very straightforward because they were composed of a single item and there was an exact match in the USDA food code file. Examples of these "whole" foods are 1 percent fat milk, pears canned in light syrup and steamed fresh carrots.

When foods consisted of multiple components or ingredients, a decision had to be made to either create the link at the whole food level or separately link each component at the ingredient/component level. Some examples of multi-component foods are lasagna, pizza, sandwiches, cake and macaroni and cheese. For more than half of the multi-component foods (12 percent of all foods), the linking was done at the ingredient/component level. This allowed the most precision because the majority of individual foods and ingredients in NDS-R foods could be found in the USDA database, whereas food codes were not available for many of the brand name and recipe items in NDS-R. The remaining foods were linked at the whole food level for reasons described below:

> **The food changed form.** The Pyramid groups counted for a food sometimes differed from the Pyramid groups of its components. A pancake, for instance, is represented only in the grain group even though eggs and milk are included as ingredients. (Documentation for the Pyramid Servings Database indicated that the eggs and milk in baked goods were not reflected in the dairy group.) Cakes were a particular problem, because the NDS-R food weight does not include the icing. Therefore, the reported weight of the food had to be inflated before being linked to an iced cake.
>
> **The food lost moisture during cooking.** If the weight of a cooked food was less than the sum of its components, it was assumed to be due to moisture loss. Linking these foods based on ingredient weights would have inflated the actual numbers of servings of Pyramid servings so they were linked at the whole food level. This included some mixed dishes, such as pasta dishes, meat pies, chili, pizza and stews. It also applied to fried potatoes and onion rings.

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[7] Personal communication with Diane Mitchell, Penn State University Diet Assessment Center, November 2001.

A component was in inedible form with no corresponding USDA code. Occasionally, beverages in NDS-R were expressed as water and powdered mix or water and concentrate. If the USDA database did not contain the powder or concentrate, the food was linked at the whole food level. This rule also applied to soup (condensed) and gravy (powder). It did not apply to foods that contained variable ingredients. For example, although the USDA database did not contain dry oatmeal, it was not possible to link every cooked oatmeal record to one USDA food code because of the variability of ingredients such as milk, fat and sugar.[8] Therefore, a USDA food code was "created" for dry oatmeal based on a conversion factor for the weight of cooked oatmeal with nothing added. This method was also applied to other hot cereals, mashed potatoes made from potato flakes, and boxed macaroni and cheese.

The above exceptions to linking at the ingredient/component level accounted for 9 percent of all foods.

The one place where the NDS-R food codes were notably more precise than options available in the USDA database was with respect to fat content. When the food description from NDS-R indicated the ingredient/component or food was fat-free and there was only a reduced-fat or "regular fat" food with which to link, the closest USDA code was selected and the discretionary fat contribution was removed from the Pyramid servings for that food. In addition, in linking meats, the percent fat content took precedence over the description of cut of meat. For example, if a particularly high fat ground beef was reported in NDS-R and no similar ground beef was found among the USDA food codes, it was linked to another type of beef with the same percent fat content.

Once all NDS-R foods were linked with USDA food codes, it was a simple process to merge the file with the Pyramid Servings Database and calculate the number of servings from each food group consumed for each student.

Pyramid Serving Recommendations

To provide some context for interpreting the mean numbers of food group servings, Exhibit E-2 shows the recommended number of servings per day for age and gender groups covering the age span of children in the universal-free school breakfast sample. The recommended number of servings per day is based on the RDA for food energy, except for the dairy (milk) group, which is based on age (USDA, 1992).

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[8] The NDS-R allows users to specify a detailed description of ingredients for some foods, which are referred to as "variable ingredients." However, there is no distinction made in the food codes at the whole food level for an item reported with certain variable ingredients (e.g., skim milk and brown sugar) versus others (e.g., 2 percent fat milk, no sugar).

Exhibit E-2

Recommended Number of Food Pyramid Servings Per Day

Gender/Age	Energy (kcal)	Recommended Servings Per Day, by Pyramid Food Group				
		Grains	Vegetables	Fruits	Dairy	Meat
Children, 7 to 10	2,000	7.8	3.7	2.7	2	2.3
Females, 11 to 14	2,200	9	4	3	3	2.4
Males, 11 to 14	2,500	9.9	4.5	3.5	3	2.6
Minimum of Food Guide Pyramid Recommended Range		6	3	2	2	2

Source: Kennedy et al. (1995); and Bowman et al. (1998)

The recommended number of servings shown here reflects targets used in the Healthy Eating Index (Kennedy et al., 1995; Bowman et al., 1998). The Food Guide Pyramid also provides sample diets at different energy levels to use as a guide to the number of servings to consume from the five main food groups. The sample diets include the following recommended maximum amounts of total fat and total added sugars at each calorie level:

	1,600 Calories	2,200 Calories	2,800 Calories
Total fat (grams)	53	73	93
Total added sugars (teaspoons)	6	12	18

As discussed above, the Pyramid Servings Database for USDA Survey Food Codes (based on the 1994-96, 1998 CSFII) was used to find the number of servings per 100 grams of food of each of the main food groups and subgroups of the Pyramid, as well as the number of grams of discretionary fat and teaspoons of added sugar. (Servings of alcohol were not considered for this population.) The methods used to develop this database have been published elsewhere (USDA/ARS, 2000), but a few points are important to note here.

Most foods (89 percent) had to be broken down into ingredients or some intermediate level of disaggregation before being categorized into their Pyramid food groups. For example, hamburger on bun was separated into ground beef, which could be counted toward the meat group, and hamburger roll, which contributed grain servings. The hamburger roll was then separated into its ingredients to determine its contribution to added sugars. Serving weights were assigned to foods or their ingredients based on the food coding database and rules developed for foods and amounts that count toward servings of each Pyramid food group. For some types of grains (snack chips, cookies, cakes, pies and breading), servings were defined based on the grain content of the food rather than a particular portion size (e.g., ½ cup rice). All fruits and vegetables were separated into ingredients and every fraction of a serving is accounted for in the Pyramid servings database. In some cases, milk and eggs used as ingredients were not counted toward the dairy group.

Discretionary fat and added sugars are components of the Pyramid tip. Discretionary fat includes all "excess" fat from the five major food groups beyond amounts that would be consumed if only the lowest fat forms were eaten. Examples include the fat in whole and lowfat milks, the fat in fried potatoes, and the fat in cheese. Fats added to foods in preparation or at the table also contributed to the total grams of discretionary fat consumed. They may include butter, oil, cream cheese, and salad dressing added to other foods. Added sugars include sugars added to foods at the table and all forms of sugar used as ingredients in processed and prepared foods (e.g., white sugar, brown sugar, molasses, corn syrup, high fructose corn syrup, and maple syrup). These ingredients are typically found in foods such as cakes and other baked desserts, soft drinks, jam, and ice cream.

The Pyramid servings database counts one ounce of lean meat or the equivalent as the serving size for the meat and meat substitutes group. For this report, ounces of meat were converted to servings based on the 2.5-ounce serving size used in the Healthy Eating Index (Kennedy et al., 1995). It was also decided to include dry beans and beans in the vegetable group, which according to the Pyramid, can be counted as either a vegetable or meat substitute. These conventions were adopted in part to facilitate comparison with other studies.

APPENDIX F

EFFECTS OF PARTICIPATION IN SCHOOL BREAKFAST

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Appendix F

Effects of Participation in School Breakfast

Appendix F presents results from analyses that explore questions about the relationship of participation in school breakfast and consumption of breakfast to student outcomes. The impact analyses presented in Chapter Five assessed the overall, district-level, and subgroup effects of the availability of universal-free school breakfast by relying on the strength of the randomized experimental design. In those analyses, all students in the treatment school sample were compared with all students in the control school sample. For school-level outcomes (e.g., attendance), all students in the treatment schools were compared with all students in the control schools. The resulting estimates show the effects of the *availability* of universal-free school breakfast. Appendix F, in contrast, presents the results of analyses that seek to address a question more difficult to answer—what were the impacts on those students who *participated* in universal-free school breakfast who would not have participated in the regular School Breakfast Program (SBP)? While these analyses address a different question, they are equally relevant to the study. That is, while the main focus of the study is on the *intent to treat*, or the availability of universal-free school breakfast, it is also important to consider the effects of the intervention on those students who are actually receiving and eating school breakfast. As outlined in Chapter Four, these analyses are intended to answer two basic questions:

1. What is the effect of participation in school breakfast on the target day on:
    - The likelihood of consuming breakfast?
    - Dietary intake at breakfast and over a 24-hour period?
    - Scores on tests of cognitive functioning?

2. What is the effect of participation in school breakfast over the course of a school year on student health, academic, and behavioral outcomes? Are low-income students more likely to benefit from participation?

These questions are addressed within the context of the randomized experimental design through use of the Bloom correction (Bloom, 1984). This statistical correction yields an unbiased estimate of the impact of universal-free school breakfast on only those students who participate without requiring the very strong assumption that participants look just like non-participants. It should be noted that because of random assignment, all other factors that could be related to outcomes are controlled within the experimental design.

The impacts on participants generally followed those impacts reported in Chapter Five of the availability of universal-free school breakfast, but were substantially larger. This follows directly from the fact that these analyses estimate the impact on participants by assuming that the program had no effect on non-participants. Thus, if the availability of universal-free school breakfast induced only an additional 20 percent of the students to participate, the effect on all students would be only one fifth of the effect on these additional participants. Note that this relationship holds for both positive and negative effects. *It must be emphasized that for the vast majority of the outcomes reported here, the impacts on participants, whether positive or negative, were not statistically significant.*

Key findings from the participation analyses include:

- Impacts on the likelihood that students consumed a nutritionally robust breakfast were significant and more substantial for school breakfast participants than reported in Chapter Five for all treatment school students. Impacts on the percent of students eating more than one substantive breakfast were higher for participants, but only small numbers of students demonstrated this eating pattern.

- Food and nutrient intakes were not substantially different between school breakfast participants and all students in treatment schools, at breakfast or over 24 hours. Of the few significant effects of school breakfast participation on dietary intake, only the reduction in cholesterol intake, both at breakfast and over 24 hours, was large enough to be considered nutritionally important. Breakfast contributed more to total daily nutrient intake for school breakfast participants relative to non-participants; the differences were most notable for calcium.

- In terms of longer-term outcomes, impacts on favorable student and parent attitudes toward school breakfast among participants were notably higher than for all treatment school students. This result was replicated for the subgroup of low-income students.

There are other questions on participation, however, that assume that participants and non-participants are similar. These questions are more difficult to address given the original design of this study. The analyses used to address these questions are non-experimental and are based on alternative configurations of the original sample, such as students who ate school breakfast in the classroom, students who ate a substantive breakfast, or students who changed their level of participation in the school breakfast program. There was wide variation both within and across schools in terms of how often students participated in school breakfast and what they consumed at breakfast, either at school or at home. Non-experimental analyses that consider variation in level of participation and amount of consumption are presented at the end of Appendix F.

Effect of School Breakfast Participation on the Target Day on Student Outcomes

In Chapter Five, impacts of the availability of universal-free school breakfast were assessed on a variety of fairly immediate nutrition outcomes based on student and parent self-report of the food eaten that day (e.g., food and nutrient intake at breakfast). Impacts were also assessed for several measures of cognitive functioning for which eating breakfast was thought to produce immediate effects. These analyses contrasted outcomes between the entire treatment group (including many students who did not eat school breakfast that day) and the entire control group (including many students who did eat school breakfast that day). The question naturally arises as to what the effect would be on those treatment school students who *did* eat school breakfast that day. Although outcomes could simply be contrasted between participants and non-participants in school breakfast on a given day, such an analysis would rest on a critical assumption that there are no systematic differences between students who elect to participate in school breakfast on a given day and students who do not. Unbiased impacts on participants in school breakfast on a given day can be obtained without making that very strong assumption through application of the statistical adjustment procedure described earlier (based on Bloom, 1984), which corrects the impact of the availability of universal-free school breakfast both for those treatment school students who did not participate in school breakfast and those students in control schools who did. That is, it provides estimates of the impact of the program on the *additional* students who participated in school breakfast because of the SBPP.

The estimates presented here were derived by dividing the overall impact estimates presented in Chapter Five by the difference between the proportion of treatment school students and the proportion of control school students participating in school breakfast on a given day. The rationale for this adjustment is presented in Appendix C. In effect, the adjustment attributes the entire observed effect on all students to the participants, on the assumption that the program has no effect on non-participants and has the same effect on crossovers (participants in the control group) as on treatment group participants. Thus, estimated effects on the additional participants are much larger than the estimated effects on all students. The statistical significance of the estimates is, however, unchanged, because the standard error of the estimate is inflated by exactly the same factor.

Measure of Target Day Participation

Since target day breakfast consumption, dietary intake, and certain aspects of cognitive functioning are outcomes more likely to be influenced by students' school breakfast participation status that day than by long-term patterns of participation, it was necessary to construct a measure of participation for the same day these data were collected rather than a longer period of time such as a school week or school year. Using available data from the breakfast dietary recall interviews, participation was defined as student selection of at least two items from one or more of five main food groups from the school breakfast offered.[1] This definition of program participation was based on the minimum number of breakfast menu items that must be selected by a student under SBP regulations for offer versus serve (OVS) and the various menu planning systems in order for the meal to be eligible for federal subsidies. It has also been used in other studies of the SBP (Devaney et al., 1993; Gleason and Suitor, 2001).

Based on the sampled students for each set of outcomes and the measure of participation described above, the average rates of school breakfast participation on the day of data collection were 47.4 percent for treatment school students and 26.4 percent for controls. The differential in school breakfast participation on a given day between treatment and control school students ranged from 0.20 to 0.22 with a mean of 0.21. Thus, in order to estimate the impact on participants, the impact on all treatment students was divided by the estimate of differential participation between the two groups. This translated to multiplying the original impact estimate by a factor of 4.75, on average. *As noted above, this adjustment has no effect on the level of statistical significance of the result, because the standard error of the impact is similarly adjusted upward.*

Findings

This section presents the results of the analysis described above for the following outcome measures:

- Breakfast consumption patterns;

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[1] The five main food groups are: milk and milk products; meat and meat alternates; grain products; fruit and fruit juices; and vegetables and vegetable juices.

- Food and nutrient intake at breakfast;
- Food and nutrient intake over 24 hours;
- Contribution of breakfast to nutrient intake over 24 hours; and
- Cognitive functioning.

The exhibits present the original impacts on all treatment school students, reflecting the availability of universal-free school breakfast. The last column of each exhibit represents the impact on participants, reflecting the correction for non-participants in the treatment group and controls who participated in the SBP.

Breakfast Consumption Patterns

As discussed in the previous chapter, the impact of the availability of universal-free school breakfast on the likelihood of eating breakfast was small and depended on breakfast being defined as providing a minimum level of food energy and at least two different food items. In addition, treatment school students were more likely to consume more than one breakfast in a day than their SBP counterparts. Exhibit F-1 shows the effects of school breakfast participation on the prevalence of consuming breakfast and the prevalence of consuming more than one breakfast.[2] As expected, for both of the more robust definitions of breakfast, the estimated effects on participants were much larger than those on all students. With respect to the percent of students eating a definition 2 or definition 3 breakfast, impacts increased from less than 5 percent of all treatment school students to more substantial proportions of participants (20 and 17 percent, respectively).

The estimated effect on participants with respect to the likelihood of eating *anything* for breakfast from more than one source (typically home and school) increased almost 40 percentage points above the impact of universal-free school breakfast overall. This indicates a much larger impact on participants relative to non-participants but, as discussed in Chapter Five, does not necessarily imply that large proportions of students are overeating. While impacts on the percent of students eating more than one substantive breakfast were higher for participants, they represent very few students.

Food and Nutrient Intake at Breakfast

The availability of universal-free breakfast had very little impact on students' dietary intake at breakfast. There were a few significant differences in favor of treatment school students, but they were small relative to daily requirements or recommendations. The effects of school breakfast participation on breakfast intake of food energy and nutrients are presented in Exhibit F-2. While significant findings for calcium and phosphorus for all treatment school students were only about 2 percent of Recommended Dietary Allowances (RDA) on average, they increased to 10 to 12 percent of RDA (11 percent of Adequate Intake for calcium) for participants. Since there are no standards for the percent of RDA that children should consume at breakfast, one can only interpret this finding with respect to the daily standards and conclude that the impacts were small from a nutritional standpoint. For cholesterol, where the effect of school participation was to magnify the significant reduction in breakfast intakes of this dietary component, the nutritional importance is somewhat greater. The impact on treatment school participants represents about one sixth of the daily recommended intake of 300 mg for cholesterol (National Research Council, 1989b).

Even with the adjustment for non-participation, impacts on students' food group intake remained small. As shown in Exhibit F-3, the effect of school breakfast participation was positive and

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[2] Note that, essentially by definition, all school breakfast participants met the criterion for a definition 1 breakfast whereas only non-participants made up the "breakfast skippers."

Exhibit F-1

Effect of Target Day Participation on Percent of Students Eating Breakfast and Percent Eating More Than One Breakfast

	Unadjusted Percentages		Model Results[3]	
Breakfast Definition[1]	**Treatment Schools %**	**Control Schools %**	**Impact on All Treatment School Students**	**Impact on Treatment School Participants**
Students Eating Breakfast				
Any food or beverage	96.61	96.37	0.32	1.55
Food from at least 2 main food groups[2] and > 10% RDA for food energy	79.88	75.85	4.18**	20.19**
Food from at least 2 main food groups[2] and > 15% RDA for food energy	62.79	59.49	3.53*	17.05*
Students Eating More than One Breakfast				
Any food or beverage	20.66	10.84	10.20**	49.41**
Food from at least 2 main food groups[2] and > 10% RDA for food energy	6.96	3.82	3.24**	15.65**
Food from at least 2 main food groups[2] and > 15% RDA for food energy	3.35	2.03	1.33**	6.42**
Number of Students	2,212	2,066		

RDA = Recommended Dietary Allowance

[1] All three definitions of breakfast include all food and beverages, excluding water, reported consumed between 5:00 a.m. and 45 minutes after the start of school and foods consumed up to 10:30 a.m. that the student/parent reported as being part of breakfast.

[2] The five main food groups are: milk and milk products, meat and meat alternates, grain products, fruit and fruit juices, and vegetables and vegetable juices.

[3] For derivation of the model results, refer to Appendix C.

* Difference is statistically significant at the .05 level.
** Difference is statistically significant at the .01 level.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit F-2

Effect of Target Day Participation on Mean Food Energy and Nutrient Intake at Breakfast[1]

	Unadjusted Means		Model Results	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact on All Treatment School Students**	**Impact on Treatment School Participants**
Food Energy (as % 1989 RDA)	20.94	20.58	0.43	2.08
Protein (as % 1989 RDA)	42.79	41.98	1.07	5.17
Percent of Food Energy from:				
Total fat	23.53	23.71	-0.36	-1.74
Saturated fat	9.42	9.43	-0.10	-0.48
Carbohydrate	65.90	66.20	-0.12	-0.58
Protein	12.31	12.02	0.31	1.50
Vitamins (as percent of RDA)[1]				
Vitamin A	62.12	60.42	2.84	13.72
Vitamin C	85.48	86.24	0.47	2.27
Vitamin B_6	78.02	79.25	0.24	1.16
Vitamin B_{12}	95.90	97.94	-0.68	-3.28
Niacin	59.57	60.21	0.20	0.97
Thiamin	78.00	78.29	0.63	3.04
Riboflavin	110.00	109.63	1.73	8.36
Folate	50.94	51.05	0.60	2.90
Minerals (as percent of RDA)[1]				
Calcium	37.73	35.75	2.39*	11.54*
Calcium (as percent of AI)	35.83	33.95	2.30*	11.11*
Iron	63.17	63.56	0.07	0.34
Magnesium	32.16	31.41	1.18	5.70
Phosphorous	38.60	36.99	2.07*	10.00*
Zinc	51.82	51.64	0.84	4.06
Other Dietary Components				
Cholesterol (mg)	40.77	50.39	-9.90**	-48.00**
Sodium (mg)	543.66	550.54	-8.00	-38.60
Fiber (gm)	2.51	2.49	0.04	0.19
Fiber (as percent of age-plus-5 gm)	17.68	17.56	0.31	1.50
Number of Students[2]	2,212	2,066		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented both as a percent of the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit F-3

Effect of Target Day Participation on Mean Food Group Intake at Breakfast

	Unadjusted Means		Model Results	
Food Group	**Treatment Schools**	**Control Schools**	**Impact on All Treatment School Students**	**Impact on Treatment School Participants**
		Number of Servings[1]		
Grain Products	**1.8**	**1.7**	**0.1**	**0.4**
Whole grains	0.5	0.5	0.0	0.0
Non-whole grains	1.3	1.2	0.1	0.3
Vegetables	**0.0**	**0.0**	**0.0**	**0.0**
Dark green vegetables	0.0	0.0	0.0	0.0
Deep yellow vegetables	0.0	0.0	0.0	0.0
White potatoes	0.0	0.0	0.0	0.0
Other starchy vegetables	0.0	0.0	0.0	0.0
Tomatoes	0.0	0.0	0.0	0.0
Cooked dry beans and peas	0.0	0.0	0.0	0.0
Other vegetables	0.0	0.0	0.0	0.0
Fruits	**0.6**	**0.5**	**0.1****	**0.3****
Citrus fruits, melons, and berries	0.3	0.3	0.0	0.0
Other fruits	0.3	0.2	0.1**	0.2**
Dairy Products	**0.8**	**0.8**	**0.1***	**0.3***
Milk	0.8	0.7	0.0	0.2
Yogurt	0.0	0.0	0.0	0.0
Cheese	0.0	0.0	0.0	0.0
Meat and Meat Substitutes	**0.1**	**0.1**	**0.0***	**-0.1***
Red meat (beef, pork, veal, lamb, game)	0.0	0.0	0.0*	0.0*
Organ meats	0.0	0.0	na[2]	na[2]
Frankfurters, sausage, luncheon meats	0.0	0.0	0.0	0.0
Poultry (chicken, turkey, other)	0.0	0.0	0.0	0.0
Fish and shellfish	0.0	0.0	0.0	0.0
Eggs	0.0	0.1	0.0**	-0.1**
Soybean products (tofu, meat analogues)	0.0	0.0	0.0	0.0
Nuts and seeds	0.0	0.0	0.0	0.0
Discretionary fat (gm)	9.3	9.4	-0.1	-0.3
Added sugars (tsp)	5.2	5.3	-0.1	-0.4
Number of Students[3]	2,212	2,066		

na = not applicable

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] An impact and effect size could not be computed because there were no foods from the food group consumed by either treatment or control school students.

[3] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

* Difference is statistically significant at the .05 level.
** Difference is statistically significant at the .01 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

significant for the mean number of Food Guide Pyramid daily servings from the fruit and dairy products groups. The magnitude of the impact on participants was approximately one third of a serving for both food groups. Recommended numbers of servings per day for children 7 to 13 years of age are 2.7 to 3.5 servings of fruit and two to three servings of dairy (Appendix E, Exhibit E-2).

Food and Nutrient Intake Over 24 Hours

Findings from the analysis of the availability of universal-free school breakfast did not supply much evidence of an improvement in students' dietary intake over 24 hours. The only statistically significant finding was a small reduction in mean cholesterol intake of 12 mg and, for some nutrients, the direction of treatment-control differences favored the control school students (i.e., they were negative). The effect of school breakfast participation on food energy and nutrient intake over 24 hours is shown in Exhibit F-4. After the adjustment for non-participation, the change in the impact on participants' 24-hour cholesterol intake was significant and amounted to about 18 percent of the daily recommended maximum (300 mg) for this dietary component. The (non-significant) negative impacts on school breakfast participants were more pronounced, but even where substantial (e.g., for protein and vitamin B_{12}), the differences were not large enough to move participants' mean intake below 100 percent of the RDA.

Mean food group intake for the full day was almost identical for treatment and control school students overall. The only significant effects were fewer servings of white potatoes and eggs for students with access to universal-free breakfasts, but the size of the difference was very small in both cases. The effect of school breakfast participation was potentially meaningful only for treatment school participants' intake of white potatoes (Exhibit F-5); the impact was about half a serving, representing a reduction in total intake of white potatoes (and vegetables overall). It is difficult to say whether or not the effect on participants found here was entirely negative nutritionally, since it is not known what proportion of white potatoes consumed by children were fried and therefore high in fat content.

Contribution of Breakfast to Food Energy and Nutrient Intake Over 24 Hours

The breakfast contribution to total daily intake was significantly greater for 8 out of 21 of the nutrients examined among students in universal-free breakfast schools compared with controls. The magnitude of the differences was small, from 1 to 2 percent of intake over 24 hours. When the analysis focused on school breakfast participants only, the impacts increased (Exhibit F-6). The most notable effect of school breakfast participation was on the contribution of breakfast to total calcium intake, where the impact was approximately 11 percentage points. Participation in the SBP has been shown to be associated with higher intakes of calcium in other studies, both at breakfast and over 24 hours (Devaney et al., 1993; Gleason and Suitor, 2001).

Cognitive Functioning

The effect of school breakfast participation on treatment school students' cognitive functioning was analyzed for three measures:

- Stimulus Discrimination;
- Digit Span; and
- Verbal Fluency.

As described in Chapter Five, these measures assess various aspects of students' memory and retrieval as well as attentional abilities. All three tests were expected to be sensitive to the immediate

Exhibit F-4

Effect of Target Day Participation on Mean Food Energy and Nutrient Intake Over 24 Hours[1]

	Unadjusted Means		Model Results	
Dietary Component	**Treatment Schools**	**Control Schools**	**Impact on All Treatment School Students**	**Impact on Treatment School Participants**
Food Energy (as % 1989 RDA)	100.26	101.94	-1.60	-7.40
Protein (as % 1989 RDA)	241.55	247.77	-5.70	-26.40
Percent of Food Energy from:				
Total fat	31.6	32.0	-0.45	-2.10
Saturated fat	11.7	12.0	-0.24	-1.12
Carbohydrate	55.4	55.0	0.45	2.10
Protein	14.4	14.5	-0.01	-0.05
Vitamins (as percent of RDA)[1]				
Vitamin A	165	164	2.13	9.92
Vitamin C	254	259	-4.10	-18.90
Vitamin B_6	219	221	-0.90	-4.19
Vitamin B_{12}	297	312	-12.00	-54.80
Niacin	208	211	-1.10	-5.08
Thiamin	243	245	-0.23	-1.07
Riboflavin	310	312	0.32	1.49
Folate	150	150	1.47	6.84
Minerals (as percent of RDA)[1]				
Calcium	134	136	-0.31	-1.44
Calcium (as percent of AI)	128	129	-0.17	-0.79
Iron	181	182	-0.71	-3.31
Magnesium	135	136	-0.41	-1.91
Phosphorous	162	162	-0.03	-0.14
Zinc	171	174	-1.60	-7.45
Other Dietary Components				
Cholesterol (mg)	202	214	-12.00*	-54.80*
Sodium (mg)	3238	3283	-43.00	-198.00
Fiber (gm)	14.1	14.2	-0.13	-0.61
Fiber (as percent of age-plus-5 gm)	99.3	100	-0.79	-3.68
Number of Students[2]	1,699	1,648		

RDA = Recommended Dietary Allowance

[1] Mean intakes of vitamins and minerals, except for calcium, are presented as a percent of the Recommended Dietary Allowances (RDAs) based on the Dietary Reference Intakes (DRIs), Recommended Intakes for Individuals. For calcium, mean intake is presented both as a percent of the 1989 RDA and the DRI-based Adequate Intake (AI).

[2] Includes students who skipped breakfast.

* Difference is statistically significant at the .05 level.

Source: Impact Study — 24-Hour Dietary Recall Interview, Spring 2001

Exhibit F-5

Effect of Target Day Participation on Mean Food Group Intake Over 24 Hours

	Unadjusted Means		Model Results	
Food Group	**Treatment Schools**	**Control Schools**	**Impact on All Treatment School Students**	**Impact on Treatment School Participants**
		Number of Servings[1]		
Grain Products	**7.5**	**7.7**	**-0.1**	**-0.4**
Whole grains	1.1	1.1	0.0	0.1
Non-whole grains	6.4	6.5	-0.1	-0.5
Vegetables	**2.1**	**2.2**	**-0.1**	**-0.4**
Dark green vegetables	0.1	0.1	0.0	0.0
Deep yellow vegetables	0.1	0.1	0.0	0.0
White potatoes	0.8	1.0	-0.1*	-0.6*
Other starchy vegetables	0.2	0.1	0.0	0.0
Tomatoes	0.4	0.4	0.0	0.1
Cooked dry beans and peas	0.1	0.1	0.0	0.0
Other vegetables	0.5	0.5	0.0	0.1
Fruits	**1.7**	**1.7**	**0.0**	**0.2**
Citrus fruits, melons, and berries	0.7	0.7	0.0	-0.1
Other fruits	1.0	1.0	0.1	0.3
Dairy Products	**2.7**	**2.7**	**0.0**	**0.0**
Milk	2.0	2.0	0.0	0.0
Yogurt	0.1	0.1	0.0	0.1
Cheese	0.6	0.6	0.0	-0.1
Meat and Meat Substitutes	**1.4**	**1.4**	**-0.1**	**-0.2**
Red meat (beef, pork, veal, lamb, game)	0.6	0.6	0.0	-0.1
Organ meats	0.0	0.0	0.0	0.0
Frankfurters, sausage, luncheon meats	0.2	0.2	0.0	0.0
Poultry (chicken, turkey, other)	0.3	0.3	0.0	0.0
Fish and shellfish	0.1	0.1	0.0	0.0
Eggs	0.1	0.1	0.0*	-0.1*
Soybean products (tofu, meat analogues)	0.0	0.0	0.0	0.0
Nuts and seeds	0.1	0.1	0.0	0.0
Discretionary fat (gm)	59.2	60.4	-1.1	-4.9
Added sugars (tsp)	24.2	24.2	0.1	0.3
Number of Students[2]	1,699	1,648		

[1] Based on the serving size definitions for the Pyramid Servings Database for USDA Survey Food Codes, 2000. USDA food codes from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals (CSFII) were assigned to food and ingredient/component codes from the Nutrition Data System (NDS-R) database before computing the number of servings for each food group.

[2] Includes students who skipped breakfast.

Note: Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

* Difference is statistically significant at the .05 level.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

Exhibit F-6

Effect of Target Day Participation on Percent Contribution of Breakfast to Nutrient Intake Over 24 Hours

	Unadjusted Means		Model Results	
Dietary Component	Treatment Schools	Control Schools	Impact on All Treatment School Students	Impact on Treatment School Participants
Food Energy	21.58	20.63	0.97*	4.41*
Macronutrients				
Protein	18.83	17.54	1.34**	6.10**
Total fat	17.22	16.33	0.77	3.50
Saturated fat	18.33	17.44	0.80	3.64
Carbohydrate	24.93	24.14	0.88*	4.00*
Vitamins				
Vitamin A	38.01	36.80	1.65	7.51
Vitamin C	32.46	31.02	1.71	7.78
Vitamin B_6	33.69	32.90	1.33	6.05
Vitamin B_{12}	31.26	30.11	1.38	6.28
Niacin	28.08	27.50	0.92	4.19
Thiamin	32.01	31.38	0.89	4.05
Riboflavin	34.93	33.83	1.42*	6.46*
Folate	33.59	33.49	0.47	2.14
Minerals				
Calcium	29.20	26.94	2.41**	10.97**
Iron	33.27	32.94	0.65	2.96
Magnesium	24.48	23.22	1.43**	6.51**
Phosphorous	24.63	22.71	1.95**	8.87**
Zinc	28.84	27.39	1.75*	7.96*
Other Dietary Components				
Cholesterol	18.21	18.79	-0.69	-3.14
Sodium	17.96	17.45	0.48	2.18
Fiber	18.72	18.33	0.54	2.46
Number of Students[1]	1,650	1,592		

[1] Does not include students who skipped breakfast.

* Difference is statistically significant at the .05 level.

** Difference is statistically significant at the .01 level.

Source: *Impact Study — 24-Hour Dietary Recall Interview, Spring 2001*

effects, if any, of breakfast consumption. There was no significant effect of universal-free school breakfast on all treatment students for any of the components of Stimulus Discrimination or Verbal Fluency, or for Digit Span scaled scores. Exhibit F-7 shows that original impacts and impacts on treatment school participants were both very small and non-significant.

Exhibit F-7

Effect of Target Day Participation on Cognitive Test Scores

	Unadjusted Means				Model Results	
	Treatment Schools		Control Schools		Impact on All Treatment School Students	Impact on Treatment School Participants
Test/Variable	**N**	**Mean**	**N**	**Mean**		
Stimulus Discrimination						
Number of trials completed	2,213	72.60	2066	72.70	-0.07	-0.35
Average trial time (sec)	2,185	4.44	2044	4.46	0.00	0.00
Average decision time (sec)	2,185	3.85	2044	3.87	0.00	0.00
Digit Span						
Scaled scores	2,181	9.25	2026	9.30	-0.04	-0.20
Verbal Fluency						
Animals	2,214	15.50	2069	15.60	-0.12	-0.60
Things to eat	2,215	14.50	2071	14.40	0.02	0.10
Total	2,215	30.00	2071	29.90	-0.09	-0.45

Source: Impact Study – Cognitive Measures, Spring 2001

Effect of School Breakfast Participation on Longer-Term Student Outcomes

As an extension of the first question concerning participation on the target day, there was also interest in estimating the impacts on school breakfast participants of cumulative participation patterns over the entire school year. The experimental design was set up to test the hypothesis that making school breakfast universally available to all students resulted in gains in student performance. This effect was diluted both by treatment school students not selecting school breakfast and by control students participating in the breakfast program in their schools. As opposed to the mere opportunity to participate, the core test of the original experimental design, a more salient question centered on the impact on those students who did participate. As a corollary, this analysis also looked at the impact of universal-free school breakfast on low-income participants only, as this is an intended focus of school meal programs.

Measure of Cumulative Participation

For the purposes of this analysis, participation was based on the cumulative pattern of selecting school breakfast over the first implementation year, SY 2000-2001. Participation could potentially range from 0 to 100 percent, depending on the number of school breakfasts selected by the student. For example, if a student selected a school breakfast on a total of 108 of 180 days during SY 2000-2001, participation was calculated as 0.60. Across the samples of students representing different sets of outcomes, the differential in cumulative school breakfast participation between treatment and control school students ranged from 0.15 to 0.19 with a mean of 0.18. To estimate the impact on participants, the impact on all treatment students was divided by the estimate of differential participation between the two groups. This translated to multiplying the original impact estimate by a factor of 5.5, on average. Under this correction, it is assumed that the resulting impact estimates are proportional to the amount of treatment (i.e., the number of days receiving school breakfast measured over the entire school year).

This adjustment, however, has no effect on the level of statistical significance of the result, because the standard error of the impact is similarly adjusted upward. Nevertheless, some reported impacts on participants, while remaining statistically non-significant, are substantively larger than the impacts on all treatment school students.

Findings

The remainder of this section presents the results of these analyses for the following outcome areas[3]:

- Student behavior ratings;
- Student health;
- Food insecurity;
- Attitudes toward breakfast;
- Attendance/tardiness; and
- Academic achievement.

Exhibits F-8 to F-13 follow the same format as exhibits in the previous section, presenting both the impacts on treatment school students relative to their controls (reflecting the availability of universal-free school breakfast) and, in the last column, the impact on treatment school participants only, reflecting the correction for nonparticipants in the treatment group and controls who participated in SBP.

With respect to student behavior, there was little to no difference between treatment and control group students in overall impacts. As expected, the estimated effects on participants were larger than those on all students. That is, the small differences indicating more negative behavior on the part of all treatment school students were reflected in larger effects on participants. As Exhibit F-8 indicates, for example, while the impact on the Conners' Oppositional Scale was less than 1 point for all treatment school students, the impact on participants was over 4 points, a substantive difference.

Similarly, for the Pediatric Symptom Checklist, a close to zero impact on all treatment school students represented more than a 1 point difference in impact on participants. When reporting this score in terms of risk of psychosocial impairment, however, the impact on participants was close to a difference of 9 percentage points (see Exhibit F-9). For BMI, while there was 1 percentile point difference between treatment and control school students on the overall impact, the impact on participants was more than 6 percentile points.

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[3] Although they do not appear in any of the exhibits presented here, the effects of school breakfast participation were also examined for measures of usual dietary intake relative to dietary standards and recommendations. While the magnitude of impacts, both positive and negative, increased by the expected factor, none of them were statistically significant.

Exhibit F-8

Effects of School Breakfast Participation on Long-Term Outcomes (Continuous Variables)

	Unadjusted Means				Model Results	
	Treatment Schools		Control Schools		Impact on All Treatment School Students	Impact on Treatment School Participants
Outcome	N	Mean	N	Mean		
Conners' Teachers Rating Scale						
Oppositional	2,028	52.25	1,829	51.48	0.77*	4.17*
Cognitive problems/inattention	2,084	53.45	1,888	53.31	0.12	0.66
Hyperactivity	2,027	52.40	1,832	51.93	0.43	2.33
ADHD Index	2,030	53.07	1,842	52.63	0.42	2.32
Effortful Control						
Ability to focus	2,155	5.06	1,993	5.09	-0.04	-0.22
Ability to follow instructions	2,155	5.29	1,993	5.30	-0.03	-0.17
Pediatric Symptom Checklist Total Score	1,708	9.95	1,655	9.80	0.22	1.21
Body Mass Index Percentile	2,183	64.56	2,059	63.40	1.10	6.11
Children's Food Security Scale Scores	1,714	1.01	1,661	1.07	-0.03	-0.16

* Difference is statistically significant at the .05 level.

Sources: Impact Study – Conners' Teacher Rating Scale (Revised Short Form), Child Behavior Survey, Height and Weight Measurements, Parent Survey, Spring 2001

Exhibit F-9

Effects of School Breakfast Participation on Long-Term Outcomes (Binary Variables)

	Unadjusted Percentages				Model Results	
	Treatment Schools		Control Schools		Impact on All Treatment School Students	Impact on Treatment School Participants
Outcome	N	%	N	%		
Students reported to be in excellent health	1,710	57.72	1,657	55.10	2.46	13.48
Students reported to have psychosocial impairment	1,708	19.79	1,655	18.55	1.56	8.57
Student attitudes: likes school breakfast	2,106	52.94	1,868	43.20	10.42**	59.40**
Parent attitudes: child likes school breakfast	1,714	41.48	1,661	30.28	11.87**	65.21**

** Difference is statistically significant at the .01 level

Sources: Impact Study – Parent Survey, Student Survey, Spring 2001

While there was a very small impact on treatment school students in terms of health status, the impact on participants was over 13 percentage points. Student attitudes toward school breakfast, from the perspective of both the student and the parent, showed large impacts indicating favorable attitudes on the part of participants. For example, while there was a 10 percentage point positive difference between treatment and control school students in their attitude toward school breakfast, that difference was close to 60 percentage points for participants.

Finally, for school-related outcomes (see Exhibit F-10), impacts on participants generally indicated lower performance compared to the impact on all treatment school students, but they are not significant.

Impacts for Low-Income Students

The analyses were replicated for a sample of low-income students, defined by their free school meal eligibility status. For these students, the respective differential in participation ranged from 0.09 to 0.14, depending on the outcome, with a mean of 0.12. Thus, the adjustment factor for these students was, on average, on the magnitude of 8.3, higher than for the sample as a whole.

Exhibits F-11 to F-13 present the results for this subgroup of low-income students on the same set of outcomes as the previous set of analyses for all students. For this group of low-income students, there were no significant differences between treatment and control school students in overall impacts on any of the tested outcomes, except in the case of parent and student attitudes toward school breakfast. Adjusting for non-participation in the treatment group and SBP participation in the control group, while not altering these non-significant findings, demonstrates some substantive differences, both positive and negative, in impacts on low-income participants.

With respect to social/emotional functioning and behavior, impacts on participants demonstrate some substantive differences (see Exhibit F-11). For example, on the Conners' Oppositional Scale, while there was little impact on all treatment school low-income students, the impact on participants was close to 6 points.

While there is little difference on BMI in overall impact on low-income students, the impact on low-income participants showed a difference of close to 12 percentile points, putting them at greater risk for being obese. Similarly, the impact on student health for low-income participants represented a difference of 25 percentage points, favoring students in the control group. Low-income participants, however, showed a higher level of food security, in contrast to the no-difference finding with the overall sample. Mirroring the results for the entire sample, parents of low-income participants were much more favorable toward school breakfast, as were the children themselves. For example, while there was a difference of 6 percentage points between all treatment and control school students in their attitude toward school breakfast, the impact on low-income participants was over 50 percentage points (see Exhibit 6.12).

The impact on attendance for low-income participants showed a larger decrease (more than two days), while the impact on tardiness showed some improvement (close to three days). With respect to academic achievement, the impact on participants, while an improvement of 12 points in reading scores for low-income treatment school students, was also a drop of almost 25 points in math scores for these same students (Exhibit 6.13). These findings for math scores mirrored the findings for the entire sample.

Exhibit F-10

Effect of School Breakfast Participation on Long-Term Outcomes (Gain Scores)

	Unadjusted Means						Model Results	
	Treatment Schools			Control Schools			Impact on All Treatment School Students	Impact on Treatment School Participants
Outcome	N	Yr 1	Gain	N	Yr 1	Gain		
Days attending school	1,885	95.75	-0.23	1,793	95.65	0.06	-0.23	-1.30
Days tardy	1,076	1.10	1.08	975	1.48	0.99	-0.17	-1.13
Reading score gain, all grades	1,193	641.72	17.60	1,166	644.93	17.29	-1.07	-5.95
Math score gain, all grades	1,210	628.13	20.94	1,187	627.84	23.61	-2.06	-11.44

Notes: Yr 1 = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Sources: Impact Study – Student-Level Attendance Data, Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit F-11

Effect of School Breakfast Participation on Low-Income Students[1] (Continuous Variables)

	Unadjusted Means				Model Results	
	Treatment Schools		Control Schools		Impact on All Treatment School Students	Impact on Treatment School Participants
Outcome	N	Mean	N	Mean		
Conners' Teachers Rating Scale						
Oppositional	742	54.08	676	53.24	0.76	5.96
Cognitive problems/inattention	761	56.86	713	56.56	0.04	.31
Hyperactivity	743	54.03	692	53.62	0.35	2.77
ADHD Index	742	55.33	697	55.19	-0.01	-.08
Effortful Control						
Ability to focus	774	4.79	729	4.70	0.10	.78
Ability to follow instructions	774	5.04	729	5.02	0.01	.08
Pediatric Symptom Checklist Total Score	576	10.47	574	10.47	0.01	0.09
Body Mass Index Percentile	807	66.99	771	65.41	1.46	11.71
Children's Food Security Scale Scores	578	1.97	576	2.09	-0.17	-1.52

[1] Low-income subgroup defined as students with free school meal eligibility status as of September 2001.

Sources: Impact Study – Conners' Teacher Rating Scale (Revised Short Form), Height and Weight Measurements, Child Behavior Survey, Parent Survey, Spring 2001

Exhibit F-12

Effects of School Breakfast Participation on Low-Income Students[1] (Binary Variables)

	Unadjusted Percentages				Model Results	
	Treatment Schools		Control Schools		Impact on All Treatment School Students	Impact on Treatment School Participants
Outcome	N	%	N	%		
Students reported to be in excellent health	575	46.09	574	49.48	-2.88	-25.53
Students reported to have psychosocial impairment	576	22.74	574	23.00	-0.47	-4.22
Student attitudes: likes school breakfast	800	55.38	745	50.34	6.30*	53.17*
Parent attitudes: child likes school breakfast	578	46.89	576	38.89	8.19**	73.10**

[1] Low-income subgroup defined as students with free school meal eligibility status as of September 2001.

* Difference is statistically significant at the .05 level
** Difference is statistically significant at the .01 level

Sources: Impact Study – Parent Survey, Student Survey, Spring 2001

Exhibit F-13

Effect of School Breakfast Participation on Low-Income Students[1] (Gain Scores)

	Unadjusted Means						Model Results	
	Treatment Schools			Control Schools			Impact on All Treatment School Students	Impact on Treatment School Participants
Outcome	N	Yr 1	Gain	N	Yr 1	Gain		
Days attending school	671	94.85	-0.16	667	94.67	0.22	-0.31	-2.44
Days tardy	302	1.38	1.14	302	1.91	1.10	-0.26	-2.74
Reading score gain, all grades	408	625.79	19.52	413	629.60	17.23	1.61	11.97
Math score gain, all grades	420	617.29	19.15	428	614.35	24.32	-3.49	-24.92

[1] Low-income subgroup defined as students with free school meal eligibility status as of September 2001.

Notes: Yr 1 = pre-implementation or baseline year
Gain = first year of implementation - pre-implementation year

Sources: Impact Study – Student-Level Attendance Data, Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Non-Experimental Analyses on Variation in Outcomes and Impacts

This section of Appendix F presents the results of a group of non-experimental analyses that are more difficult to address, given the design of the study. These analyses are based on alternative configurations of the original sample and address the following key questions:

- What is the effect of change in participation in school breakfast on child health, academic, or behavioral outcomes?
    - Are low-income students more likely to benefit from a change in participation in school breakfast?
- Are students who consume a substantive breakfast more likely to score higher on tests of cognitive functioning than students who consume a minimal breakfast?
- Do schools that serve breakfast in the classroom have higher participation rates and, as a result, more improved outcomes?

Relationship Between Change in Level of Participation and Student Outcomes

The first question focuses on whether students who increased their participation in school breakfast enjoyed better school outcomes than students who had the same level of participation. As the sampling design was initially based on identifying "likely changers," this question took on added relevance. The experimental design was set up to test the hypothesis that making school breakfast universally available to all children would result in gains in student performance. It was recognized that this effect would be diluted both by treatment school students not selecting school breakfast and by control school students participating in their breakfast program. Therefore, this non-experimental analysis was designed to test the effect of participating in school breakfast as opposed to the mere opportunity to participate, the core test of the original experimental design. Of course, this analysis suffers from the limitation that because students were not randomly assigned to different levels of participation, it is difficult to attribute any resulting differences to the consumption of school breakfast alone with a known level of confidence.

For the purposes of this analysis, "changers" were defined as those students who increased their participation by 40 percent or more from baseline to implementation year. Operationally, these are students who increased their participation in school breakfast for a total of two or more days per week from the previous year. So, for example, students who ate breakfast, on average, one day per week in SY1999-2000 and increased their level of participation to three days per week in SY2000-2001 were labeled changers. These students were then contrasted with a group of students who either had no change in their level of school breakfast participation from one year to the next, or whose participation had actually declined during that period.[4] As this analysis focused solely on the criterion of school breakfast participation, treatment as well as control school students were included. In all the analytic models tested, the set of student-level covariates (age, gender, ethnicity and eligibility status) was included to help adjust for any pre-existing differences between the two groups.

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[4] The actual level of participation among the "changers" was 70 percent, contrasted to 15 percent for the "non-changers".

Exhibits F-14 to F-16 present the results of this analysis for a number of outcome areas:

- Student Behavior Ratings;
- Student Health;
- Food Insecurity;
- Attitudes Toward School Breakfast;
- Attendance/Tardiness; and
- Academic Achievement.[5]

In terms of cognitive functioning, there were no statistically significant differences found between the two groups of students. However, school breakfast changers were more likely to receive more negative behavior ratings than the non-changers. On the Conners' and Effortful Control rating scales, as well as the Pediatric Symptom Checklist, statistically significant differences were found between the two groups of students. Students who increased their level of school breakfast participation were systematically given less positive behavior ratings by both their teachers and their parents. Students who were school breakfast changers also came from families with higher levels of food insecurity. There were no reported differences in terms of student health or BMI.

Students who were labeled "changers" attended school more often and were tardy less often. Changers also had lower gains in academic achievement than non-changers. In these tests, the reported differences, although statistically significant, were small in magnitude. In addition, students who were changers, as well as their parents, generally had more positive attitudes toward school breakfast. In these analyses, the differences in parent attitude towards breakfast were generally more favorable, especially compared to the experimental analyses based on treatment-control school differences. Given that parent attitudes were recorded during the implementation year, it is difficult to determine, however, if changes in attitudes accounted for changes in participation, or vice versa.

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[5] Results of these analyses are only displayed for third to fourth grade gains because of the small sample sizes associated with other grade-level scores.

Exhibit F-14

Outcomes by Participation Changer Status (Continuous Variables)[1]

	Unadjusted Means				Model Results	
	Changers		Non-Changers			
Outcome	N	Mean	N	Mean	Adjusted Difference	Effect Size
Conners' Teachers Rating Scale						
Oppositional	570	52.64	1,892	51.21	1.13	0.12
Cognitive problems/inattention	590	53.66	1,930	52.61	1.12	0.10
Hyperactivity	572	53.02	1,880	51.45	1.41*	0.15
ADHD Index	577	53.65	1,885	51.97	1.74**	0.16
Effortful Control						
Ability to focus	599	5.02	1,961	5.20	-0.20*	-0.14
Ability to follow instructions	599	5.19	1,961	5.39	-0.20**	-0.14
Body mass index percentile	623	63.69	2,103	63.17	-2.60	-0.09
Pediatric symptom checklist total score	502	10.10	1,666	9.61	0.38	0.07
Child Food Security Scale Scores	496	1.15	1,667	0.98	0.12	0.06

[1] Changers = School breakfast participation increase of more than or equal to 40 percentage points.
Non-changers = No change in school breakfast participation (less than or equal to 0 percentage points).

* Difference is statistically significant at the .05 level

** Difference is statistically significant at the .01 level

Sources: *Impact Study - Cognitive Measures, Conners' Teacher Rating Scale (Revised Short Form), Parent Survey, Spring 2001*

Exhibit F-15

Outcomes by Participation Changer Status (Binary Variables)[1]

	Unadjusted Percentages				Model Results	
	Changers		Non-Changers		Adjusted %	Odds
Outcome	N	%	N	%	Difference	Ratio
Students reported to be in excellent health	503	55.67	1,667	55.97	1.68	1.07
Students reported to have psychosocial impairment	502	20.32	1,666	17.65	1.79	1.13
Student Attitudes						
Likes school breakfast	628	63.38	1,851	41.60	20.29**	2.28
Parent Attitudes						
SBP is a well-balanced meal	503	48.71	1,672	33.91	10.98**	1.59
SBP should be for low-income families only	499	4.21	1,640	4.82	-0.31	0.93
Kids like SBP	503	51.69	1,672	28.71	20.45**	2.40
Receives enough information about SBP	503	55.47	1,672	39.23	10.73**	1.55
SBP served at a convenient time and place	503	75.94	1,672	55.68	19.39**	2.40
It is easy to participate in SBP	503	85.29	1,672	56.16	27.05**	3.87
SBP gives all children an opportunity to eat breakfast	503	87.28	1,672	69.14	17.59**	2.92

[1] Changers = School breakfast participation increase of more than or equal to 40 percentage points.
Non-changers = No change in school breakfast participation (less than or equal to 0 percentage points).

** Difference is statistically significant at the .01 level

Sources: Impact Study - Parent Survey, Student Survey, Spring 2001

Exhibit F-16

Outcomes by Participation Changer Status (Gain Variables)[1]

	Unadjusted Means						Model Results	
	Changers			Non-Changers			Adjusted	Effect
Outcome	N	Yr 1	Gain	N	Yr 1	Gain	Difference	Size
Days attending school	572	95.76	0.14	1,640	95.90	-0.23	0.51**	0.12
Days tardy	225	0.55	1.13	1,055	1.46	0.79	-0.54*	-0.17
Reading score gain, third to fourth grade	178	628.23	17.60	485	638.88	24.59	-7.97*	-0.17
Math score gain, third to fourth grade	179	614.73	22.21	491	619.31	26.45	-5.31	-0.14

[1] Changers = School breakfast participation increase of more than or equal to 40 percentage points.
Non-changers = No change in school breakfast participation (less than or equal to 0 percentage points).

Notes: Yr 1 = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

* Difference is statistically significant at the .05 level
** Difference is statistically significant at the .01 level

Sources: Impact Study – Student-Level Attendance Data, Student-Level Academic Achievement Test Scores, 2000-2001

Of the school breakfast changers, 60 percent were eligible for free/reduced-price school meals, compared to 51 percent of the non-changers. The question naturally arises as to whether changes in outcomes for only those students who are free/reduced-price eligible should be analyzed.

Furthermore, given the focus of previous research on low-income children, this sample was restricted to students coming from families with annual household incomes of $20,000 or less. Thus, the next set of non-experimental analyses focused solely on this restricted sample of low-income children who had changed their school breakfast participation by 40 percent or more from pre-implementation to implementation year. Exhibits F-17 to F-19 present the results for this sub-sample of students on the exact same set of outcomes as the previous set of analyses for all school breakfast changers. Because of the reduced sample size, however, these analyses do not enjoy a high level of statistical power.

For this group of low-income students, there were no statistically significant differences found between school breakfast changers and non-changers on any of the tested outcomes, except in the case of parent attitudes. Mirroring the results for the entire changer sample, parents of low-income changers were generally more favorable toward school breakfast. Previous differences favoring the changers on student attitudes towards school breakfast, however, were no longer statistically significant.

Exhibit F-17

Outcomes by Participation Changer Status, Low-Income Students (Continuous Variables)[1]

	Unadjusted Means				Model Results	
	Changers		Non-Changers			
Outcome	N	Mean	N	Mean	Adjusted Difference	Effect Size
Conners' Teachers Rating Scale						
Oppositional	93	53.23	234	52.90	-0.49	-0.05
Cognitive problems/inattention	97	56.08	243	56.09	-0.17	-0.01
Hyperactivity	93	52.45	237	54.07	-1.98	-0.18
ADHD Index	95	54.24	237	55.19	-1.29	-0.11
Effortful Control						
Ability to focus	98	4.82	249	4.74	0.03	0.02
Ability to follow instructions	98	5.10	249	5.03	-0.03	-0.02
Body mass index percentile	103	64.86	264	65.72	-2.12	-0.07
Pediatric symptom checklist total score	103	10.36	264	11.08	-0.69	-0.12
Child Food Security Scale Scores	102	2.29	264	2.52	0.12	0.05

[1] Changers = School breakfast participation increase of more than or equal to 40 percentage points.
Non-changers = No change in school breakfast participation (less than or equal to 0 percentage points).
Low-income students = Parents reported an annual household income of less than $20,000.

Sources: Impact Study - Cognitive Measures, Conners' Teacher Rating Scale (Revised Short Form), Parent Survey, Spring 2001

Exhibit F-18

Outcomes by Participation Changer Status, Low-Income Students (Binary Variables)[1]

	Unadjusted Percentages				Model Results	
	Changers		Non-Changers		Adjusted % Difference	Odds Ratio
Outcome	N	%	N	%		
Students reported to be in excellent health	103	52.43	264	47.73	6.14	1.28
Students reported to have psychosocial impairment	103	21.36	264	26.89	-6.00	0.72
Student Attitudes						
Likes school breakfast	102	57.84	253	52.17	4.54	1.20
Parent Attitudes						
SBP is a well-balanced meal	103	55.34	265	49.06	-0.68	0.97
SBP should be for low-income families only	103	9.71	261	8.05	.	.
Kids like SBP	103	48.54	265	48.30	-0.63	0.97
Receives enough information about SBP	103	61.17	265	50.94	2.76	1.12
SBP served at a convenient time and place	103	83.50	265	64.91	18.30**	2.68
It is easy to participate in SBP	103	83.50	265	67.55	15.87**	2.42
SBP gives all children an opportunity to eat breakfast	103	86.41	265	73.96	12.46*	2.24

[1] Changers = School breakfast participation increase of more than or equal to 40 percentage points.
Non-changers = No change in school breakfast participation (less than or equal to 0 percentage points).
Low-income students = Parents reported an annual household income of less than $20,000.

* Difference is statistically significant at the .05 level
** Difference is statistically significant at the .01 level

Sources: Impact Study - Parent Survey, Student Survey, Spring 2001

Exhibit F-19

Outcomes by Participation Changer Status, Low-Income Students (Gain Variables)[1]

	Unadjusted Means						Model Results	
	Changers			Non-Changers			Adjusted Difference	Effect Size
Outcome	N	Yr 1	Gain	N	Yr 1	Gain		
Days attending school	97	94.83	0.12	186	95.08	-0.41	0.80	0.19
Days tardy	22	0.58	1.78	112	2.49	0.61	0.75	0.14
Reading score gain, third to fourth grade	33	631.88	7.62	49	611.01	26.10	-8.83	-0.19
Math score gain, third to fourth grade	32	608.94	21.20	48	603.95	25.20	2.42	0.07

[1] Changers = School breakfast participation increase of more than or equal to 40 percentage points.
Non-changers = No change in school breakfast participation (less than or equal to 0 percentage points).
Low-income students = Parents reported an annual household income of less than $20,000.

Notes: Yr 1 = pre-implementation or baseline year
Gain = first year of implementation – pre-implementation year

Sources: Impact Study – Student-Level Attendance Data, Student-Level Academic Achievement Test Scores, 2000-2001

Relationship Between Consumption of Breakfast and Cognitive Functioning

The results from the experimental impact analyses and analysis of impacts on school breakfast participants indicated no differences between treatment and control school students in terms of cognitive functioning. The fact that previous research in this field has pointed to effects of nutrition on cognitive functioning raises the question of whether a relationship can be found in the study sample between what children consumed at breakfast (at school or at home) and how well they performed on the battery of cognitive tests.

As a preliminary answer to this question, simple correlations between several indicators of breakfast nutrient content and cognitive performance were computed, to see if consumption of food energy (calories), carbohydrates, fat, or protein had any bearing on how well students did. In addition, coefficients were estimated measuring the relationship of the time interval between eating breakfast and being tested to student performance, based on the hypothesis that students who had a longer break between eating breakfast and testing would do more poorly.

Exhibit F-20 displays the results of correlating various indicators of nutrient intake and breakfast timing and scores on the various cognitive measures. As the table indicates, there is little to no relationship between what students consumed and how well they performed. Moreover, in terms of timing, the results indicate a slight negative relationship. That is, the longer the interval between breakfast and testing, the better students did in terms of average trial time on Stimulus Discrimination and the two tests of verbal fluency.[6]

Exhibit F-20

Correlations Between Cognitive Scores, Breakfast Nutrient Intake, and Breakfast Timing

Variable	Time Interval, Minutes	Breakfast Calories	Breakfast Carbohydrates	Breakfast Fat	Breakfast Protein
Stimulus Discrimination					
Total number of trials	-0.03	0.02	0.02	0.03	0.02
Total number of errors	0.02	0.01	0.00	0.01	0.01
Average trial time	-0.24*	-0.01	-0.02	0.00	-0.01
Average view time	-0.24*	-0.01	-0.02	0.00	-0.01
Digit Span					
Total score, scaled	-0.01	0.02	0.03	0.00	0.02
Verbal Fluency					
Animals	0.15*	0.07*	0.08*	0.03	0.04
Things to eat	0.19*	0.07*	0.08*	0.04	0.02

N=4,278

*Correlation is statistically significant at the .05 level.

Sources: Impact Study – Cognitive Measures and 24-Hour Dietary Recall Interview, Spring 2001

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[6] Depending on when the cognitive tests were administered, this finding may be attributable to students being more awake later in the morning.

In order to unpack this set of results further, the question of whether students who ate a more substantive breakfast performed better on the cognitive measures was explored. In order to test this hypothesis, four distinct groups of students from both treatment and control schools were formed:

- Group 1: Students who skipped breakfast or whose breakfast did not meet the criteria for Group 2.
- Group 2: Students whose breakfast contained more than 10 percent of the RDA for food energy and at least two food components.
- Group 3: Students whose breakfast contained more than 15 percent of the RDA for food energy and at least two food components.
- Group 4: Students whose breakfast contained at least 25 percent of the RDA for food energy and at least three food components.

An analysis of variance was conducted on the four groups to determine if there were significant differences in terms of cognitive performance, controlling for student differences on age, gender, eligibility status, and ethnicity. Specifically, it was of interest to determine whether students who had the most substantive breakfast (Group 4) did better. The results of these analyses are summarized in Exhibit F-21. Parallel to the results found in the previous analysis, consumption of breakfast was not positively related to student performance. In fact, on tests of trial and decision time as part of the stimulus discrimination battery, students who had a more substantive breakfast had longer trial and decision times (i.e., lower performance) than those eating a minimal breakfast. This may, of course, reflect differences between the two groups of students unrelated to consumption of breakfast. Because there was no way to control for such differences, it is not possible to place as much confidence in these non-experimental comparisons as in experimental estimates of impact.

Exhibit F-21

Cognitive Test Scores by Breakfast Consumption Category[1]

	Mean Score				
Test/Variable	Group 1	Group 2	Group 3	Group 4	Results of ANOVA
Stimulus Discrimination					
Number of trials completed	73.00	72.93	73.09	73.16	ns
Average trial time (sec)	4.36	4.33	4.48	4.56	*, **
Average decision time (sec)	3.79	3.75	3.88	3.97	*, **
Digit Span					
Scaled scores	9.31	9.24	9.28	9.28	ns
Verbal Fluency					
Animals	15.49	15.35	15.43	15.65	ns
Things to eat	14.49	14.27	14.28	14.66	ns
Total	29.96	29.61	29.72	30.31	ns
Sample Size	944	716	1,828	790	

ns = not significant

[1] Breakfast consumption categories include:
Group 1: Students who skipped breakfast or whose breakfast did not meet the criteria for Group 2.
Group 2: Students whose breakfast contained more than 10% of the RDA for food energy and at least 2 food components.
Group 3: Students whose breakfast contained more than 15% of the RDA for food energy and at least 2 food components.
Group 4: Students whose breakfast contained at least 25% of the RDA for food energy and at least 3 food components.

* Difference between Groups 1 and 4 is statistically significant at the .05 level.
** Difference between Groups 2 and 4 is statistically significant at the .05 level.

Sources: Impact Study – Cognitive Measures and 24-Hour Dietary Recall Interview, Spring 2001

Impacts for Schools Serving Breakfast in the Classroom

The experimental impact analyses reported in Chapter Five showed little impact of the availability of universal-free school breakfast on student outcomes. If one accepts the premises of the conceptual model presented in Chapter One, then it stands to reason that more robust effects would be expected when the model was more fully implemented. Findings from the Implementation Study suggest that when school breakfast is served in the classroom, participation dramatically increases.

To further explore this question, an analysis of several school-level outcome variables was conducted to determine if schools serving school breakfast in the classroom showed positive impacts on outcomes.[7] This subsample of 18 schools, on average, had a school breakfast participation rate of 65 percent, ranging from 36 to 80 percent. These schools were paired with their matched control schools to analyze the impact on the following school-level outcomes:

- School breakfast participation;
- Average daily attendance;

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[7] Although this analysis involved comparisons of the experimentally formed pairs of treatment and control schools, the decision to serve breakfast in the classroom was not randomly determined. In one district, for example, all treatment schools were expected to serve in the classroom, while other sites took volunteers. For this reason, as this decision was endogenous to participating in the SBPP, this analysis does not technically constitute an experimental comparison.

- Normal Curve Equivalent (NCE) reading score;
- NCE math score;
- School atmosphere (from Teacher Climate Survey);
- Student behavior (from Teacher Climate Survey);
- Weekly number of disciplinary incidents; and
- Weekly number of school nurse visits.

Exhibits F-22 and F-23 display the results from this analysis, broken down by variables with two time points (gain scores) and one time point (continuous measures).

The results here indicate no significant differences between treatment schools serving breakfast in classrooms and their control school counterparts, despite a difference of almost 40 percentage points in level of participation. The results are strikingly similar to those for the sample as a whole. Thus, while serving breakfast in the classroom has robust effects on increasing student participation, it does not necessarily translate into enhanced outcomes for these students.

Exhibit F-22

Effects on Outcomes for Schools Serving Breakfast in Classrooms[1] (Two Time Points)

	Unadjusted Means						Model Results	
	Treatment Schools			Control Schools			Adjusted	Effect
Outcome	N	Yr 1	Change	N	Yr 1	Change	Difference	Size
Breakfast participation (percent)	18	27.25	38.19	20	24.44	0.97	38.86**	4.12
Days attending school (percent)	17	95.34	-2.97	17	94.96	-2.75	-0.04	-0.02
NCE reading score, all grades	18	51.51	-0.95	20	52.55	-0.10	-0.66	-0.15
NCE math score, all grades	18	52.25	0.16	20	52.86	-0.55	0.77	0.19

[1] Analysis includes treatment schools that served breakfast in the classrooms (N=18) and their matched control schools (N=20).

Notes: Yr 1 = pre-implementation or baseline year
Change = first year of implementation – pre-implementation year

** Difference is statistically significant at the .01 level.

Sources: Impact Study – School-Level Participation and Attendance Data and School-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit F-23

Effects on Outcomes for Schools Serving Breakfast in Classrooms[1] (One Time Point)

	Unadjusted Means				Model Results	
	Treatment Schools		Control Schools		Adjusted	Effect
Outcome	N	Mean	N	Mean	Difference	Size
Teacher Climate Survey [2]						
School atmosphere	106	3.22	95	3.38	-0.15	-0.31
Student behavior	106	2.68	95	2.78	-0.10	-0.20
School Logs [3]						
Disciplinary incidents/ office visits	340	1.19	370	0.77	0.40	0.39
Health incidents/ nurse visits	340	3.92	364	3.71	0.16	0.06

[1] Analysis includes treatment schools that served breakfast in the classrooms (N=18) and their matched control schools (N=20).

[2] Surveys completed by teachers from each classroom where student-level data were collected.

[3] School Logs collected over 20 weeks of school. The weekly average number of incidents per 100 students was calculated.

Sources: Impact Study - Teacher Climate Survey, Logs of Visits by Students to the School Office and School Nurse, Spring 2001

APPENDIX G

SUPPLEMENTARY EXHIBITS: IMPACT STUDY SUBGROUP FINDINGS

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Exhibit G-1

Academic Achievement Outcomes by School Meal Eligibility Status[1]

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Paid				Free/Reduced						
	Treatment		Control		Treatment		Control				
Measure/District	N	Mean	N	Mean	N	Mean	N	Mean	Paid Impact	Free/ Reduced Impact	Inter-action Effect
Math Score Gain, All Grades											
All	589	22.65 (1.13)	570	22.82 (1.19)	621	19.31 (1.29)	617	24.33 (1.18)	-0.65	-3.91♦	* +
A	38	30.76 (4.48)	28	24.64 (4.66)	17	20.76 (6.96)	16	35.31 (6.01)	3.49	-13.68	n.s.
B	142	26.61 (2.14)	122	23.66 (2.24)	126	24.13 (2.38)	99	24.59 (2.26)	3.07	2.17	n.s.
C	22	37.41 (7.21)	22	32.55 (4.99)	59	22.22 (4.14)	63	32.27 (3.24)	-1.93	-4.07	n.s.
D	167	16.87 (1.73)	170	22.37 (1.80)	114	22.14 (2.66)	129	22.48 (2.21)	-4.89	1.87	n.s.
E	192	20.77 (2.22)	204	22.67 (2.37)	270	15.66 (2.21)	279	23.19 (2.04)	-2.60	-7.90♦	n.s.
F	28	27.36 (4.71)	24	12.04 (6.41)	35	15.21 (4.32)	31	19.73 (4.97)	18.16	0.38	*
Reading Score Gain, Third to Fourth Grade	264	18.14 (2.53)	259	28.35 (2.36)	277	25.01 (2.32)	286	21.55 (1.99)	-8.97♦	2.77	*
Math Score Gain, Second to Third Grade											
All[2]	52	31.19 (4.39)	38	18.50 (4.05)	51	19.04 (4.73)	50	29.42 (3.85)	14.94	-6.82	** +
B	47	27.66 (4.28)	36	16.67 (4.04)	32	17.69 (6.11)	32	22.09 (3.84)	12.94	-1.22	n.s.
C	5	64.40 (16.25)	2	51.50 (9.50)	19	21.32 (7.63)	18	42.44 (7.41)	37.78	-4.83	n.s.

n.s. = Not significant.

[1] All test scores have been converted to Stanford-9 scale scores.

[2] Schools in Districts A, D, E, and F did not administer tests to students in second grade.

* The two-way interaction between treatment and eligibility status is statistically significant at the .05 level.
** The two-way interaction between treatment and eligibility status is statistically significant at the .01 level.
+ The three-way interaction between treatment, eligibility, and district is statistically significant at the .05 level.
♦ Difference between treatment and control students is statistically significant at the .05 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit G-2

Nutrition Outcomes by School Meal Eligibility Status

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Paid				Free/Reduced						
	Treatment		Control		Treatment		Control				
Measure	N	Mean	N	Mean	N	Mean	N	Mean	Paid Impact	Free/ Reduced Impact	Inter-action Effect
Breakfast Consumption											
Percent of Students Who Ate Two Breakfasts											
Ate any food	1018	17.58 (0.01)	949	4.74 (0.01)	1194	23.28 (0.01)	1117	16.03 (0.01)	13.10••	7.45••	**
Ate two substantive breakfasts	1018	5.80 (0.01)	949	2.11 (0.00)	1194	7.96 (0.01)	1117	5.28 (0.01)	3.79	2.73••	*
Dietary Intake											
Nutrient Intake at Breakfast											
Percent of Energy from:											
Total fat	989	23.52 (0.39)	920	22.77 (0.43)	1148	23.54 (0.35)	1071	24.51 (0.39)	0.40	-1.00	*
Carbohydrate	989	65.70 (0.46)	920	67.19 (0.55)	1148	66.07 (0.42)	1071	65.35 (0.48)	-1.20	0.77	**
Sodium (mg)	1018	569.78 (12.50)	949	558.17 (16.50)	1194	521.39 (11.64)	1117	544.05 (13.15)	12.60	-26.00	*
Food Group Intake at Breakfast (servings)											
Discretionary fat (gm)	1018	9.3 (0.29)	949	8.9 (0.29)	1194	9.4 (0.25)	1117	9.8 (0.29)	0.4	-0.5	*
Nutrient Intake Over 24 Hours											
As Percent of RDA:											
Vitamin A	843	164.15 (3.40)	800	168.60 (3.58)	856	165.72 (3.23)	848	160.21 (3.29)	-4.50	8.53	*
Vitamin B_6	843	210.40 (4.12)	800	220.80 (4.07)	856	226.64 (4.31)	848	221.90 (3.97)	-11.00	8.44	*
Food Group Intake Over 24 Hours (servings)[1]											
Total grains	843	7.6 (0.11)	800	7.7 (0.12)	856	7.4 (0.11)	848	7.6 (0.12)	0.0	-0.2	*
Non-whole grains	843	6.4 (0.10)	800	6.5 (0.12)	856	6.4 (0.10)	848	6.6 (0.12)	0.0	-0.2	*
Breakfast Contribution to Full Day (%)											
Total fat	821	17.03 (0.41)	778	15.33 (0.41)	829	17.41 (0.44)	814	17.29 (0.44)	1.65••	-0.03	*
Sodium	821	18.68 (0.39)	778	17.60 (0.40)	829	17.24 (0.39)	814	17.31 (0.39)	1.13	-0.13	*

[1] Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

* The two-way interaction between treatment and eligibility status is statistically significant at the .05 level.

** The two-way interaction between treatment and eligibility status is statistically significant at the .01 level.

•• Difference between treatment and control students is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Exhibit G-3

Other Outcomes by School Meal Eligibility Status

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Paid				Free/Reduced						
	Treatment		Control		Treatment		Control				
Measure	N	Mean	N	Mean	N	Mean	N	Mean	Paid Impact	Free/ Reduced Impact	Inter-action Effect
School Breakfast Participation[1]	861	23.28 (0.98)	794	1.81 (0.52)	915	23.83 (1.03)	810	8.97 (0.91)	22.77••	13.27••	**
Student Behavior											
Effortful Control: Ability to Focus[2]	982	5.31 (0.05)	875	5.44 (0.05)	1127	4.84 (0.04)	1045	4.78 (0.05)	-0.14•	0.06	*
Student Attitudes											
Percent of students reporting that they like SBP	942	50.85 (1.63)	794	36.52 (1.71)	1164	54.64 (1.46)	1074	48.14 (1.53)	14.29••	7.32••	*
Child Health											
Percent of students reported to be in excellent health	852	66.43 (1.62)	807	60.35 (1.72)	858	49.07 (1.71)	850	50.12 (1.72)	5.72•	-0.79	*

[1] Complete data were not available for District C.

[2] Items scored on a 7-point Likert scale ranging from Extremely Untrue of this Child (1) to Extremely True of this Child (7). A high score indicates good effortful control.

* The two-way interaction between treatment and eligibility status is statistically significant at the .05 level.
** The two-way interaction between treatment and eligibility status is statistically significant at the .01 level.
• Difference between treatment and control students is statistically significant at the .05 level.
•• Difference between treatment and control students is statistically significant at the .01 level.

Sources: Impact Study - Child Behavior Survey, Student Survey, Parent Survey, Spring 2001 and Student-Level School Breakfast Participation Data, 1999-2000 and 2000-2001

Exhibit G-4

Nutrition Outcomes by Minority Status of Students

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	White				Non-white						
	Treatment		Control		Treatment		Control		White	Non-white	Interaction
Measure/District	N	Mean	N	Mean	N	Mean	N	Mean	Impact	Impact	Effect
Breakfast Consumption											
Percent of Students Who Ate Two Breakfasts											
Ate any food	1287	19.74 (0.01)	1187	8.00 (0.01)	836	23.09 (0.01)	783	15.45 (0.01)	11.90••	7.57••	**
Dietary Intake											
Food Group Intake at Breakfast (servings)											
Added sugar (tsp)	1287	5.2 (0.13)	1187	5.7 (0.16)	836	5.3 (0.20)	783	4.7 (0.18)	-0.5•	0.6•	*
Food Group Intake Over 24 Hours (servings)[1]											
Total fruits											
All	1067	1.7 (0.05)	1021	1.6 (0.05)	623	1.8 (0.07)	622	1.8 (0.07)	0.1	0.0	* ++
A	130	1.4 (0.11)	105	1.4 (0.15)	25	1.5 (0.20)	20	2.0 (0.33)	0.0	-0.6	n.s.
B	158	1.6 (0.12)	151	1.7 (0.15)	99	2.4 (0.21)	112	1.8 (0.19)	0.0	0.7	*
C	27	2.8 (0.37)	28	1.6 (0.33)	69	2.3 (0.20)	68	2.5 (0.23)	1.2	-0.2	*
D	339	1.8 (0.09)	333	1.8 (0.10)	79	1.6 (0.19)	74	1.8 (0.23)	-0.1	-0.2	n.s.
E	326	1.6 (0.08)	337	1.5 (0.07)	319	1.6 (0.08)	325	1.7 (0.08)	0.1	0.0	n.s.
F	87	1.6 (0.14)	67	1.1 (0.13)	32	1.9 (0.21)	23	2.6 (0.71)	0.4	-0.8	*
Other fruits	1067	1.0 (0.03)	1021	0.9 (0.04)	623	1.1 (0.05)	622	1.1 (0.05)	0.1	0.0	*
Meat and meat substitutes	1067	1.4 (0.03)	1021	1.3 (0.03)	623	1.4 (0.04)	622	1.5 (0.04)	0.0	-0.2••	*
Breakfast Contribution to Full Day (%)											
Carbohydrate	1042	24.58 (0.34)	994	24.38 (0.36)	600	25.47 (0.48)	593	23.76 (0.45)	0.38	1.75•	*

n.s. = Not significant.

[1] Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

* The two-way interaction between treatment and ethnicity is statistically significant at the .05 level.
** The two-way interaction between treatment and ethnicity is statistically significant at the .01 level.
++ The three-way interaction between treatment, ethnicity, and district is statistically significant at the .01 level.
• Difference between treatment and control students is statistically significant at the .05 level.
•• Difference between treatment and control students is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Exhibit G-5

School Breakfast Participation by Minority Status of Students

Measure/District	Unadjusted Means (Standard Errors)								Results of Impact Models		
	White				Non-white						
	Treatment		Control		Treatment		Control				
	N	Mean	N	Mean	N	Mean	N	Mean	White Impact	Non-white Impact	Interaction Effect
School Breakfast Participation											
All[1]	1076	23.82 (0.92)	965	3.92 (0.61)	639	24.44 (1.21)	583	7.84 (1.03)	19.37••	16.05••	** +
A	150	18.75 (1.60)	118	2.55 (1.19)	29	19.52 (2.70)	23	1.70 (0.61)	16.38••	16.91••	n.s.
B	199	23.51 (2.40)	169	0.95 (1.76)	127	24.33 (2.61)	115	2.08 (1.89)	22.05••	21.67••	n.s.
D	251	9.20 (1.18)	220	1.29 (1.06)	56	8.82 (3.34)	46	1.43 (3.20)	7.89••	8.55	n.s.
E	371	29.93 (1.70)	375	6.88 (0.98)	400	27.46 (1.58)	377	10.79 (1.37)	21.24••	17.76••	n.s.
F	105	44.99 (2.99)	83	5.55 (2.64)	27	17.98 (6.40)	22	7.08 (5.01)	39.88••	16.47	**

n.s. = Not significant.

[1] Complete data were not available for District C.

** The two-way interaction between treatment and ethnicity is statistically significant at the .01 level.
+ The three-way interaction between treatment, ethnicity, and district is statistically significant at the .05 level.
•• Difference between treatment and control students is statistically significant at the .01 level.

Source: Impact Study – Student-Level School Breakfast Participation Data, 2000-2001

Exhibit G-6

Behavioral Outcomes by Minority Status of Students

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	White				Non-white						
	Treatment		Control		Treatment		Control				
Measure/District	N	Mean	N	Mean	N	Mean	N	Mean	White Impact	Non-white Impact	Interaction Effect
Conners' ADHD Index[1]											
All	1190	52.68 (0.31)	1067	51.84 (0.32)	753	53.48 (0.41)	687	53.49 (0.43)	0.87♦	-0.14	* +
A	137	53.42 (1.01)	93	52.43 (1.24)	29	53.10 (2.10)	22	54.73 (2.66)	1.05	-1.74	n.s.
B	205	53.08 (0.75)	156	52.17 (0.91)	144	54.88 (0.97)	110	51.38 (0.96)	0.97	2.97	n.s.
C	33	57.09 (1.98)	28	50.96 (1.76)	78	53.72 (1.30)	75	54.81 (1.23)	6.39	-1.24	*
D	331	52.18 (0.57)	325	51.02 (0.55)	76	54.37 (1.41)	76	50.11 (0.93)	1.30	3.99	n.s.
E	384	52.80 (0.56)	377	52.50 (0.55)	398	52.60 (0.53)	377	53.77 (0.59)	0.42	-1.19	n.s.
F	100	50.61 (0.94)	88	51.16 (0.88)	28	56.29 (2.64)	27	62.85 (2.41)	-1.06	-6.88	n.s.
Conners' Hyperactivity[2]											
All	1178	52.01 (0.28)	1057	51.20 (0.29)	763	52.80 (0.39)	688	52.77 (0.40)	0.78♦	-0.02	* ++
A	139	53.08 (0.90)	92	51.82 (1.11)	27	52.19 (2.08)	22	54.50 (2.41)	1.27	-2.30	n.s.
B	201	52.20 (0.68)	149	51.37 (0.77)	145	53.06 (0.84)	114	50.81 (0.86)	0.86	2.35	n.s.
C	31	56.87 (2.22)	28	49.32 (1.71)	80	53.43 (1.31)	77	53.17 (1.02)	7.65	0.26	*
D	329	51.44 (0.50)	321	50.55 (0.48)	78	53.42 (1.25)	76	49.54 (0.86)	1.04	3.80	n.s.
E	378	51.82 (0.49)	379	51.77 (0.51)	405	52.36 (0.53)	372	53.20 (0.56)	0.11	-0.84	n.s.
F	100	51.20 (1.01)	88	50.82 (0.86)	28	54.89 (2.39)	27	61.59 (2.67)	-0.45	-5.91	n.s.
Effortful Control, Ability to Focus[3]											
All	1231	5.10 (0.04)	1099	5.22 (0.04)	788	5.02 (0.05)	726	4.94 (0.05)	-0.14♦	0.07	** ++
A	144	4.93 (0.13)	98	5.26 (0.14)	30	4.97 (0.26)	23	4.63 (0.34)	-0.29	0.37	n.s.
B	210	5.11 (0.10)	157	5.26 (0.12)	150	4.95 (0.12)	116	5.12 (0.13)	-0.14	-0.20	n.s.
C	35	4.51 (0.23)	28	5.25 (0.28)	84	5.09 (0.16)	78	4.93 (0.17)	-0.76	0.21	*
D	345	5.17 (0.07)	337	5.22 (0.08)	81	4.78 (0.18)	78	5.35 (0.15)	-0.12	-0.62♦	*
E	394	5.08 (0.08)	388	5.15 (0.08)	415	5.10 (0.07)	400	4.88 (0.07)	-0.07	0.20	n.s.
F	103	5.30 (0.15)	91	5.35 (0.15)	28	4.85 (0.28)	31	4.11 (0.30)	-0.07	0.90	*

Exhibit G-6 (continued)

Behavioral Outcomes by Minority Status of Students

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	White				Non-white						
	Treatment		Control		Treatment		Control		White	Non-white	Interaction
Measure/District	N	Mean	N	Mean	N	Mean	N	Mean	Impact	Impact	Effect
Effortful Control: Ability to Follow Instructions[3]											
All	1231	5.32 (0.04)	1099	5.41 (0.04)	788	5.24 (0.05)	726	5.17 (0.05)	-0.10	0.03	* +
A	144	5.17 (0.12)	98	5.47 (0.15)	30	5.17 (0.26)	23	5.06 (0.25)	-0.29	0.12	n.s.
B	210	5.27 (0.10)	157	5.42 (0.12)	150	5.26 (0.12)	116	5.46 (0.13)	-0.13	-0.26	n.s.
C	35	4.83 (0.24)	28	5.51 (0.21)	84	5.22 (0.17)	78	5.14 (0.15)	-0.67	0.12	n.s.
D	345	5.45 (0.07)	337	5.40 (0.08)	81	5.20 (0.17)	78	5.52 (0.14)	-0.02	-0.40	n.s.
E	394	5.30 (0.08)	388	5.36 (0.07)	415	5.25 (0.07)	400	5.10 (0.07)	-0.06	0.13	n.s.
F	103	5.41 (0.15)	91	5.49 (0.14)	28	5.13 (0.25)	31	4.39 (0.26)	-0.08	0.94	•

n.s. = Not significant.

[1] Identifies children/adolescents "at risk" for Attention Deficit Hyperactivity Disorder (ADHD).

[2] High scorers have difficulty sitting still, feel more restless and impulsive than most individuals their age, and have the need to always be on the go.

[3] Items scored on a 7-point Likert scale ranging from Extremely Untrue of this Child (1) to Extremely True of this Child (7). A high score indicates good effortful control.

* The two-way interaction between treatment and ethnicity is statistically significant at the .05 level.
** The two-way interaction between treatment and ethnicity is statistically significant at the .01 level.
+ The three-way interaction between treatment, ethnicity, and district is statistically significant at the .05 level.
++ The three-way interaction between treatment, ethnicity, and district is statistically significant at the .01 level.
• Difference between treatment and control students is statistically significant at the .05 level.

Sources: Impact Study - Child Behavior Survey, Conners' Teacher Rating Scale, Spring 2001

Exhibit G-7

Academic Achievement Outcomes by Grade of Students[1]

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Older[2]				Younger						
	Treatment		Control		Treatment		Control				
Measure/District	N	Mean	N	Mean	N	Mean	N	Mean	Older Impact	Younger Impact	Interaction Effect
Math Score Gain, All Grades											
All	559	19.38 (1.26)	545	18.48 (1.25)	651	22.27 (1.17)	642	27.96 (1.10)	0.39	-4.61••	** +
A	22	37.91 (5.17)	12	19.00 (6.44)	33	20.85 (5.00)	32	32.09 (4.41)	20.72	-11.39	**
B	101	24.37 (2.27)	74	21.62 (2.63)	167	26.10 (2.16)	147	25.31 (2.00)	4.03	1.92	n.s.
C	35	29.97 (5.12)	37	29.35 (3.25)	46	23.59 (5.13)	48	34.65 (4.10)	1.42	-9.11	n.s.
D	153	16.42 (1.99)	148	15.45 (1.92)	128	22.11 (2.25)	151	29.25 (1.88)	0.90	-5.28	n.s.
E	211	14.98 (2.48)	242	19.42 (2.24)	251	20.15 (2.05)	241	26.54 (2.10)	-6.04	-5.01	n.s.
F	37	22.12 (3.61)	32	5.38 (4.38)	26	18.46 (6.05)	23	31.67 (6.00)	18.62•	-7.37	**

n.s. = Not significant.

[1] All test scores have been converted to Stanford–9 scale scores.

[2] Older students were in grades 4, 5, 6, and 7; younger students were in grades 2, 3, and 4.

** The two-way interaction between treatment and ethnicity is statistically significant at the .01 level.

+ The three-way interaction between treatment, ethnicity, and district is statistically significant at the .05 level.

• Difference between treatment and control students is statistically significant at the .05 level.

•• Difference between treatment and control students is statistically significant at the .01 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit G-8

Nutrition Outcomes by Grade of Students

Measure	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Older[1]				Younger						
	Treatment		Control		Treatment		Control		Older Impact	Younger Impact	Interaction Effect
	N	Mean	N	Mean	N	Mean	N	Mean			
Dietary Intake											
Nutrient Intake at Breakfast											
Calcium (as percent of RDA)	1039	30.52 (0.73)	941	30.20 (0.85)	1173	40.54 (0.87)	1125	37.08 (0.82)	0.66	3.67•	•
Sodium (mg)	1039	536.97 (12.20)	941	571.67 (17.03)	1173	549.58 (11.92)	1125	532.86 (12.68)	-34.00	14.50	•
Breakfast Contribution to Full Day (%)											
Phosphorus	750	23.84 (0.45)	714	22.96 (0.48)	900	25.30 (0.42)	878	22.50 (0.42)	0.97	2.75••	•

[1] Older students were in grades 4, 5, and 6; younger students were in grades 2 and 3.

- • The two-way interaction between treatment and grade is statistically significant at the .05 level.
- • Difference between treatment and control students is statistically significant at the .05 level.
- •• Difference between treatment and control students is statistically significant at the .01 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

Exhibit G-9

Other Outcomes by Grade of Students

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Older[1]				Younger						
	Treatment		Control		Treatment		Control		Older	Younger	Interaction
Measure	N	Mean	N	Mean	N	Mean	N	Mean	Impact	Impact	Effect
Cognitive Functioning											
Verbal Fluency: Things to Eat[2]	1041	16.15 (0.16)	945	16.32 (0.16)	1174	13.03 (0.13)	1126	12.79 (0.13)	-0.17	0.20	*
Student Attitudes											
Percent of students reporting that they like SBP	993	48.14 (1.59)	841	31.75 (1.61)	1113	57.23 (1.48)	1027	52.58 (1.56)	16.34••	4.82•	**

[1] Older students were in grades 4, 5, and 6; younger students were in grades 2 and 3.

[2] Child was asked to name as many things to eat as possible in 60 seconds.

* The two-way interaction between treatment and grade is statistically significant at the .05 level.
** The two-way interaction between treatment and grade is statistically significant at the .01 level.
• Difference between treatment and control students is statistically significant at the .05 level.
•• Difference between treatment and control students is statistically significant at the .01 level.

Sources: Impact Study - Student Survey, Cognitive Measures, Spring 2001

Exhibit G-10

Academic Achievement Outcomes by Gender of Students[1]

Measure	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Male				Female						
	Treatment		Control		Treatment		Control				
	N	Mean	N	Mean	N	Mean	N	Mean	Male Impact	Female Impact	Interaction Effect
Math Score Gain, 4th to 5th Grade	122	21.47 (2.54)	140	25.3 (2.30)	177	29.08 (1.87)	160	22.41 (2.00)	-3.78	6.94•	*

n.s. = Not significant.

[1] All test scores have been converted to Stanford–9 scale scores.

- * The two-way interaction between treatment and gender is statistically significant at the .05 level.
- • Difference between treatment and control students is statistically significant at the .05 level.

Source: Impact Study – Student-Level Academic Achievement Test Scores, 1999-2000 and 2000-2001

Exhibit G-11

Nutrition Outcomes by Gender of Students

	Unadjusted Means (Standard Errors)								Results of Impact Models		
	Male				Female						
	Treatment		Control		Treatment		Control				
Measure	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**Male Impact**	**Female Impact**	**Interaction Effect**
Dietary Intake											
Nutrient Intake at Breakfast											
Phosphorus (as percent of RDA)	1047	42.12 (1.19)	1005	39.22 (1.10)	1165	35.44 (0.86)	1061	34.88 (1.00)	3.37•	0.88	*
Food Group Intake at Breakfast (servings)[1]											
Total grains	1047	1.9 (0.05)	1005	1.8 (0.04)	1165	1.6 (0.04)	1061	1.6 (0.04)	0.1	0.0	*

[1] Means and impacts have been rounded. Significant adjusted differences of 0.0 represent impacts of less than 1/10th of a serving.

* The two-way interaction between treatment and gender is statistically significant at the .05 level.

• Difference between treatment and control students is statistically significant at the .05 level.

Source: Impact Study – 24-Hour Dietary Recall Interview, Spring 2001

APPENDIX H

DATA COLLECTION INSTRUMENTS

Appendix H

Data Collection Instruments

The following sample data collection instruments are available on the Food and Nutrition Service website at: http://www.fns.usda.gov/oane/MENU/Published/CNP/CNP.HTM.

Implementation Study

Guide for School District Administrator Interview
Guide for School Foodservice Director Interview
Guide for School Principal Interview (Treatment Schools)
Guide for School Principal Interview (Control Schools)
Guide for Cafeteria Manager Interview
Guide for Teacher Interview
Guide for School Custodian Interview

Teacher Mail-in School Survey (School Climate Survey)
Student Focus Group Moderator's Guide

Impact Study

Student Survey
Parent Survey
Child Behavior Surveys:
  Conners' Teacher Rating Scale
  Effortful Control

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